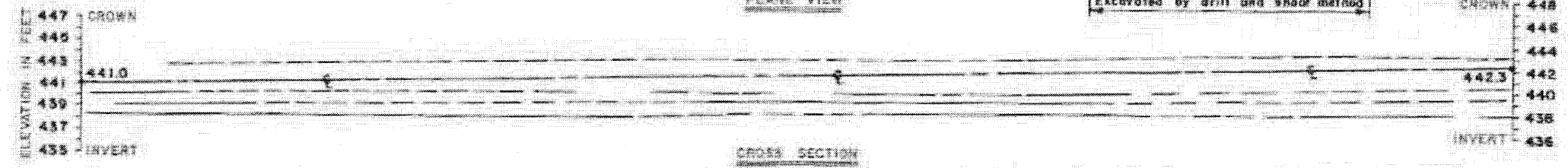
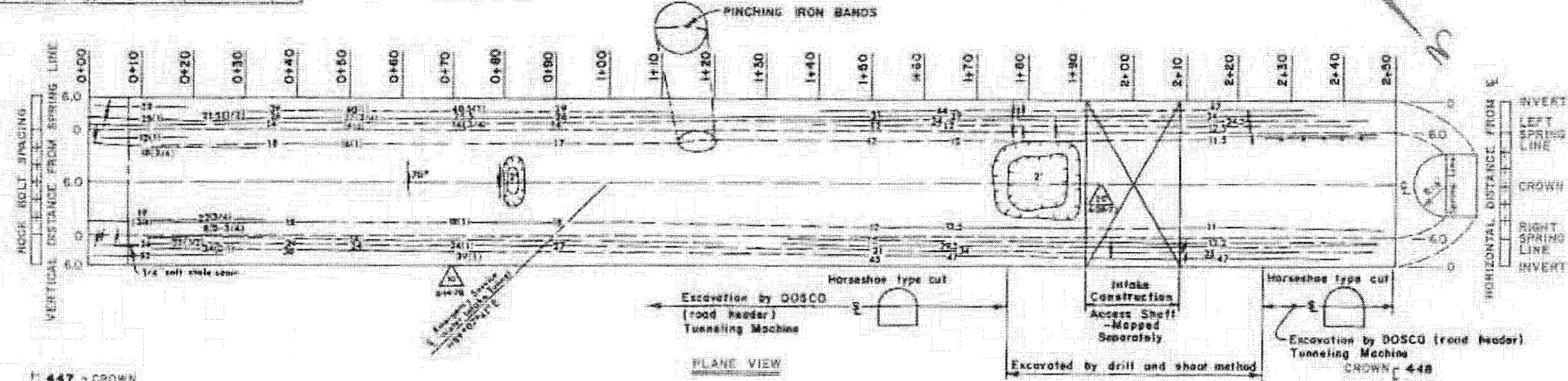


- SYMBOLS**
- 1 1/2" - HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - 12(0-2)" - DISCONTINUOUS IRON BED
  - 12(1)" - HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - 18(40-2)" - DISCONTINUOUS IRON BED WITHIN GREY BED
  - ⚡ - FRACTURE
  - — — - FAULT
  - — — - BEDDING PARTING
  - — — - VERTICAL JOINT
  - — — - INCLINED JOINT
  - — — - BEDDING, STRIKE AND DIP

- — — - MOISTURE ALONG BEDDING PARTING
  - — — - SEEPAGE FROM FEATURE
  - ⊖ - OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - ⚠ - METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE
- \*Notes:  
Number(s) in parentheses indicates bed thickness.  
Number preceding parenthesis indicates inches above or below spring line at station of measurement.



0+00	0+20	0+40	0+60	0+80	1+00	1+20	1+40	1+60	1+80	2+00	2+20	2+40	2+60	2+80
2 Rock bolts in steel ribs with wire mesh between, steel surface covered with plastic sheet										no. 4 no. 5 at crown		no. 2 no. 5 at crown		
3 Rock bolts in steel ribs spaced by wire mesh										Steel bolts & mesh		Steel 3 Rock bolts in steel ribs at 3.5' & 4' centers spaced by wire mesh		
2'-8"					2'-7"					2'-8"				
Bedding fractures only					Very widely spaced					non-persistent 1'-3'				
No inflow														
approx. 24' of limestone, approx. 25' of gneiss till & approx. 112.7' of shale														

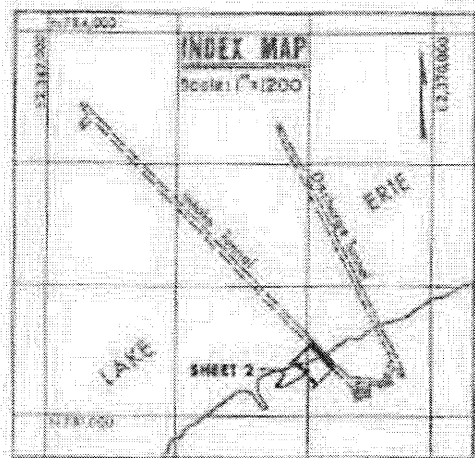
- EXCAVATION PROGRESS
- ESTIMATED ROCK CONDITION (TERZAGHI NO.)
- TEMPORARY SUPPORT SYSTEM
- BEDDING SPACING
- FRACTURE SPACING
- WATER CONDITION
- DEPTH OF COVER

(Rev. 10 1/63)

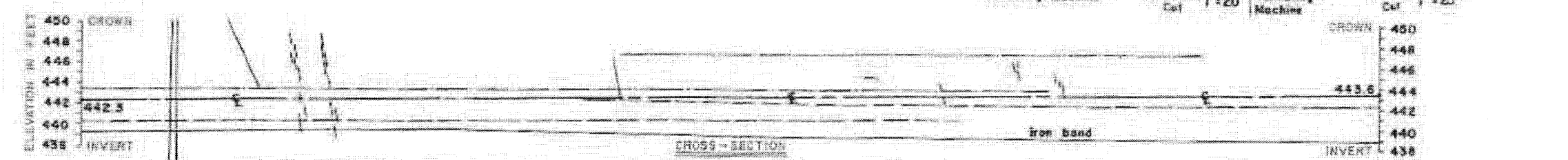
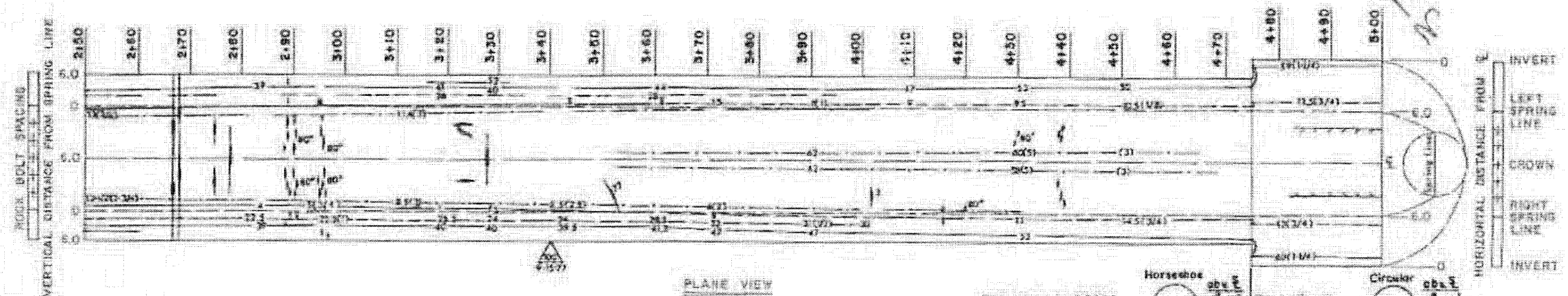
**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations

Figure 2.3-41 (Sheet 1 of 24)



- SYMBOLS**
- 1 1/2" (1 1/2)° HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - 12 (12-2)° DISCONTINUOUS IRON BED
  - 12 (12)° HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - 10 (10-2)° DISCONTINUOUS IRON BED WITHIN GREY BED
  - ⚡ FRACTURE ZONE
  - ⚡ FAULT
  - ⋯ BEDDING PARTING
  - ⊥ VERTICAL JOINT
  - ⊥ INCLINED JOINT
  - ⊥ BEDDING, STRIKE AND DIP
- MOISTURE ALONG BEDDING PARTING
- SEEPAGE FROM FEATURE
- OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
- METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE
- \*Note:*  
 Number(s) in parentheses indicates (s) thickness.  
 Number preceding parenthesis indicates inches above or below spring line of station of measurement.



No. 4	No. 5	No. 4	No. 2	No. 4	No. 4-5	No. 4
1'-0"	1'-3"	1'-3"	2'-0"	1'-4"	1/2'-0"	3/4'-4"
1'-10"	1'-10"	2'-10"	1'-10"	1'-10"	1'-10"	1'-10"
No. follows						

2 Rock bolts at two foot centers in ribs spaced 3-3.5 apart spanned by wire mesh

Excavation Progress

ESTIMATED ROCK CONDITION (TERZAGHI NO.)

TEMPORARY SUPPORT SYSTEM

BEDDING SPACING

FRACTURE SPACING

WATER CONDITION

DEPTH OF COVER

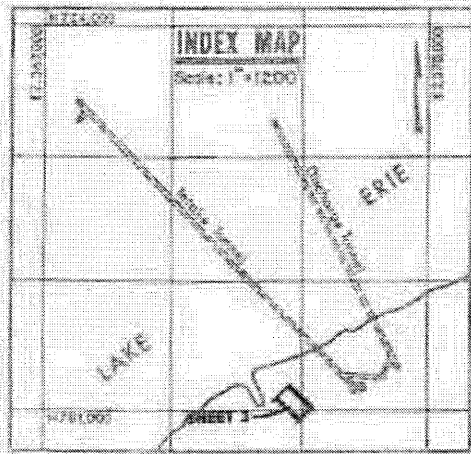
Scale: 1" = 10' water, 1" = 100' surface (shown)

(Rev. 12-1-73)

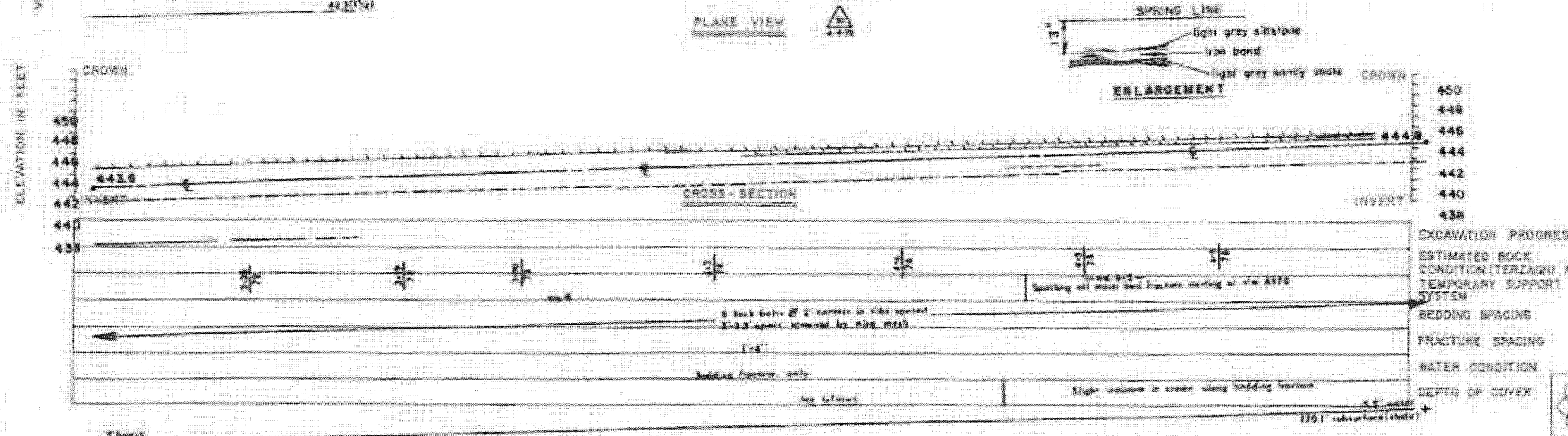
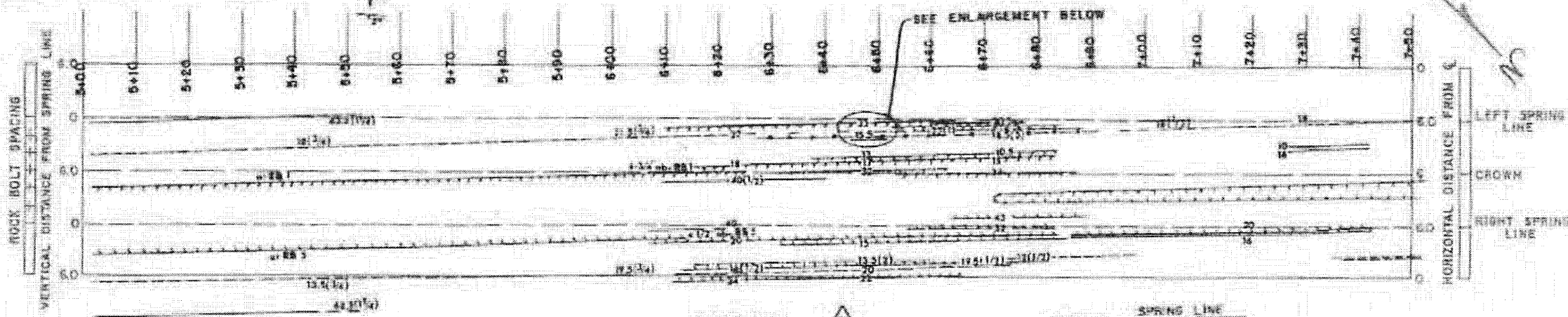
**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations

Figure 2.5-47 (Sheet 2 of 34)



- SYMBOLS**
- HARD, TAN, BROWN, CHERTY IRON BED OR LAMINÆ
  - DISCONTINUOUS IRON BED
  - HARD LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - DISCONTINUOUS IRON BED WITHIN GREY BED
  - FRACTURE
  - FAULT
  - BEDDING PARTING
  - VERTICAL JOINT
  - INCLINED JOINT
  - BEDDING, STRIKE AND DIP
- MOISTURE ALONG BEDDING PARTING**
- SEEPAGE FROM FEATURE
  - OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - METHANE GAS, MAXIMUM PERCENT I.E.L. WITH DATE OF OCCURRENCE
- Note:* Numbers in parentheses indicate bed thickness. Number preceding parentheses indicates inches above or below spring line at station of measurement.

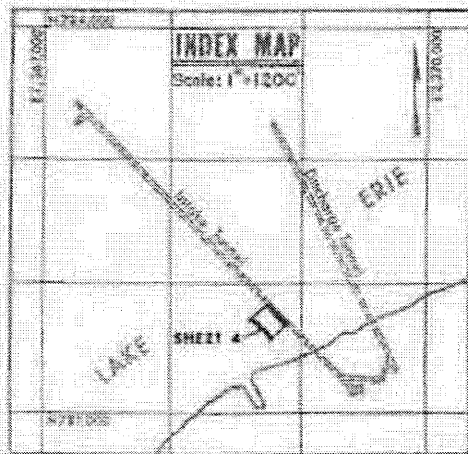


(Rev. 12-1/03)

**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations

Figure 2-5-47 (Sheet 3 of 24)

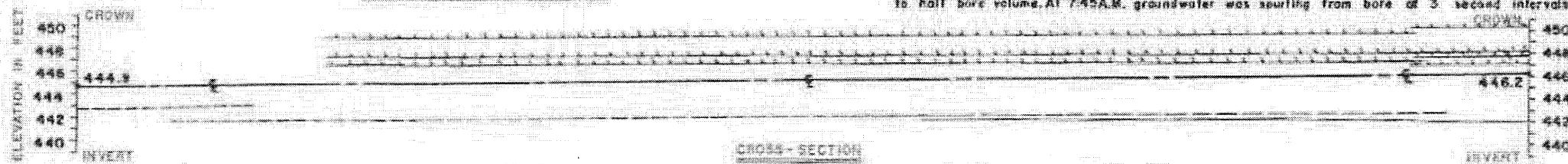
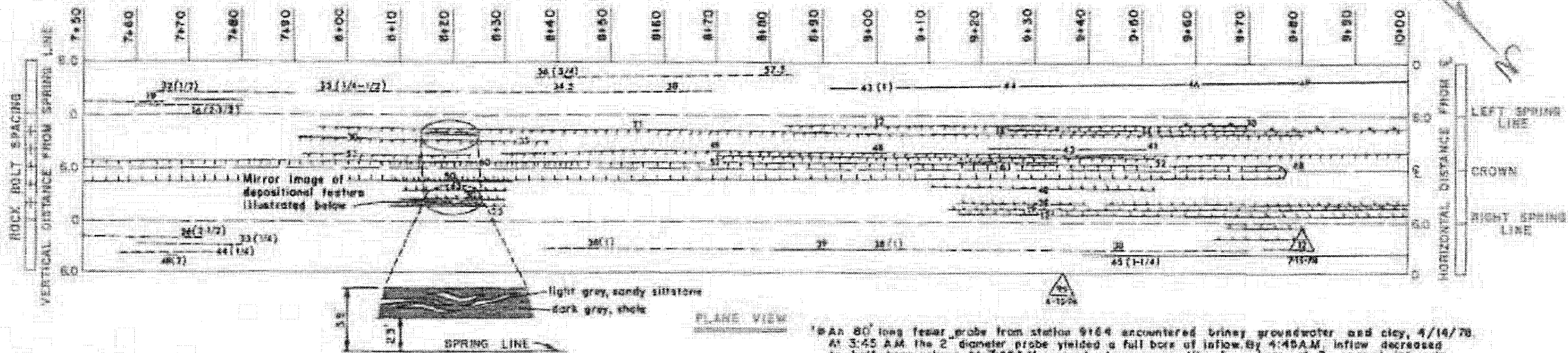


- HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINÆ
- DISCONTINUOUS IRON BED
- HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
- DISCONTINUOUS IRON BED WITH GREY BED
- FRACTURE
- FAULT
- BEDDING PARTING
- VERTICAL JOINT
- INCLINED JOINT
- BEDDING, STRIKE AND DIP

**SYMBOLS**

- MOISTURE ALONG BEDDING PARTING
- SEEPAGE FROM FEATURE
- OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
- METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE

\*Note:  
 Number(s) in parentheses indicates bed thickness.  
 Number preceding parenthesis indicates inches above or below spring line at station of measurement.



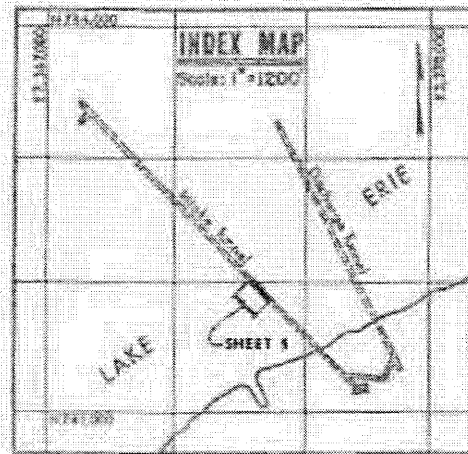
1'-4"	1'-7"	2'-5"	2'-10"
no. 4-5		no. 4-1	
Continued spalling along bedding fractures near crown			
3 Rock bolts @ 2' centers in ribs spaced 1.5' apart, secured by wire mesh			
Bedding fractures only			
Moisture along bedding fractures near crown		Slight moisture along 20% of bedding fractures and rock bolts	
2.5' water		18.3' water	
120' diameter (approx.)		116.2' diameter (approx.)	

- EXCAVATION PROGRESS
- ESTIMATED ROCK CONDITION (TERZAGHI NO.)
- TEMPORARY SUPPORT SYSTEM
- BEDDING SPACING
- FRACTURE SPACING
- WATER CONDITION
- DEPTH OF COVER

(Rev. 12 1/03)  
**PERRY NUCLEAR POWER PLANT**

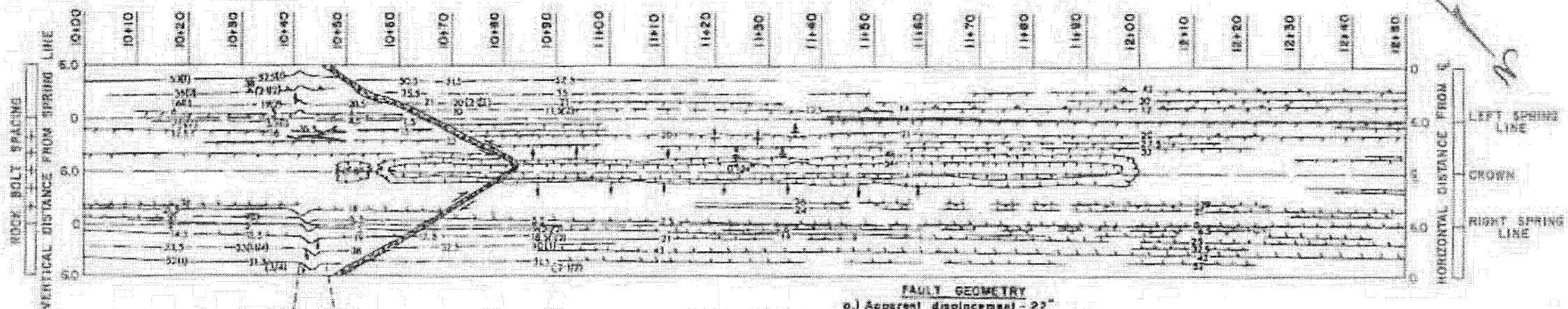
Geologic Map of Tunnel Excavations

Figure 2.5-47 (Sheet 4 of 24)

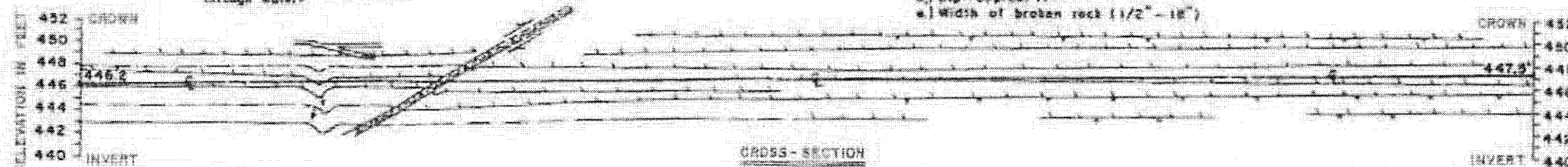


- SYMBOLS**
- $\frac{1}{2}$ " HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - 12(0-2)" DISCONTINUOUS IRON BED
  - 12(1)" HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - 10(1/2, 2)" DISCONTINUOUS IRON BED WITHIN GREY BED
  - ↔ FRACTURE
  - ↔ FAULT (with sense of motion)
  - BEDDING PARTING
  - VERTICAL JOINT
  - INCLINED JOINT
  - BEDDING, STRIKE AND DIP

- MOISTURE ALONG BEDDING PARTING
  - SEEPAGE FROM FEATURE
  - OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - △ METHANE GAS, MAXIMUM PERCENT I.E.L. WITH DATE OF OCCURRENCE
- \* Note: Number(s) in parentheses indicates bed thickness. Number preceding parenthesis indicates inches above or below spring line at station of measurement.



- FAULT GEOMETRY**
- Apparent displacement - 22"
  - Actual vertical displacement - 12"
  - Strike - N 47° E
  - Dip - approx. 17°
  - Width of broken rock (1/2" - 18")



no. 3-6		no. 3-8		no. 4-5	
3 rock bolts at 2' centers in steel ribs at 3'-3.5' centers		0-24" of overbreak between rock bolt no. 3-4		3 rock bolts at 2' centers in steel ribs at 3'-3.5' centers spanned by wire mesh	
2'-10"		2'-9"		approx. 8'-14"	
10'		Bedding fractures & 1/2" to 1 1/2" thick, highly fractured fault zone w/gouge		bedding fractures only, spaced as above	
No inflows		Slight seep from top		Slight inflow from rock bolts	
7.3' water, 111.7' subsurface (hole)		No inflows		Slight moisture along approx. 20% of bedding fractures and rock bolts	
		Water dripping from shielding		2" inflow at approx. 1 gal./min.	
				8.3' water, 112.2' subsurface (hole)	

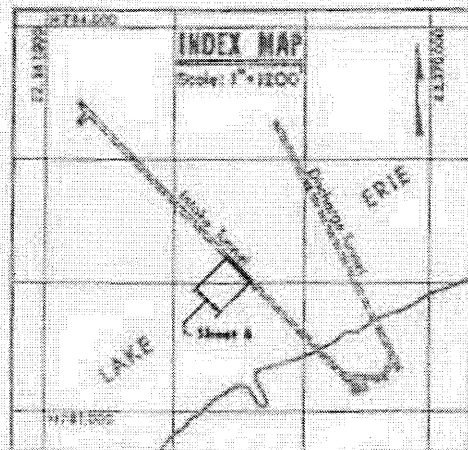
- EXCAVATION PROGRESS
- ESTIMATED ROCK CONDITION (TERZAGHI NO.)
- TEMPORARY SUPPORT SYSTEM
- BEDDING SPACING
- FRACTURE SPACING
- WATER CONDITION
- DEPTH OF COVER

(Rev. 12/1/03)

**PERRY NUCLEAR POWER PLANT**

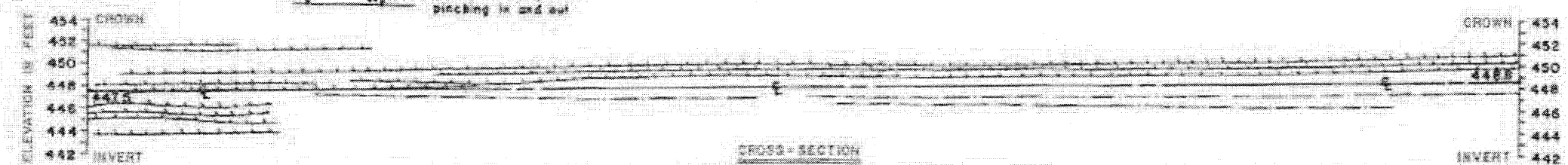
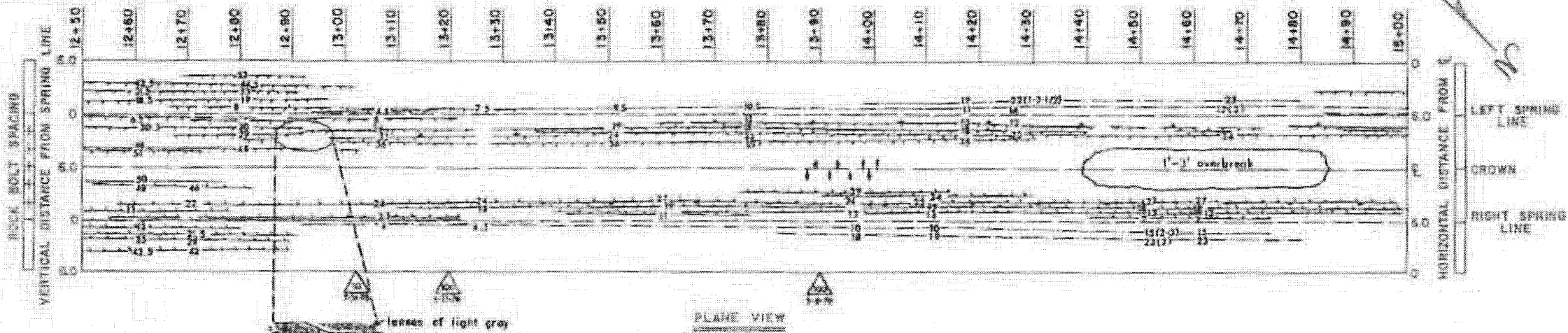
Geologic Map of Tunnel Excavations

Figure 2.5-4 (Sheet 3 of 24)



- SYMBOLS**
- 1 1/2" HARD, TAN, BROWN, CHERT, IRON BED OR LAMINAE
  - 2 (2-3)" DISCONTINUOUS IRON BED
  - 2 1/2" HARD, LIGHT GREY SANDY SHALE TO SILTSTONE BED
  - 2 1/2" DISCONTINUOUS IRON BED WITHIN GREY BED
  - Fracture symbol
  - Fault symbol
  - Bedding Parting symbol
  - Vertical Joint symbol
  - Inclined Joint symbol
  - Bedding, Strike and Dip symbol

- Moisture along bedding parting symbol
  - Seepage from feature symbol
  - Overexcavation or overbreak zone, maximum amount shown symbol
  - Methane gas, maximum percent L.E.L. with date of occurrence symbol
- Notes:**  
 Number(s) in parentheses indicates bed thickness.  
 Number preceding parenthesis indicates inches above or below spring line at station of measurement.



Approx. 8'-12"	Approx. 3'-10"	Approx. 3'-5"	Approx. 6'-10"
Bedding fractures only, spaced at bedding spacing			
Approximately 20% at bedding fractures and rock bolts show minimal amount of moisture			
No inflows			
+ 11.5 water		+ 10.7 water	
+ 11.5 subsurface (data)		+ 10.7 subsurface (data)	

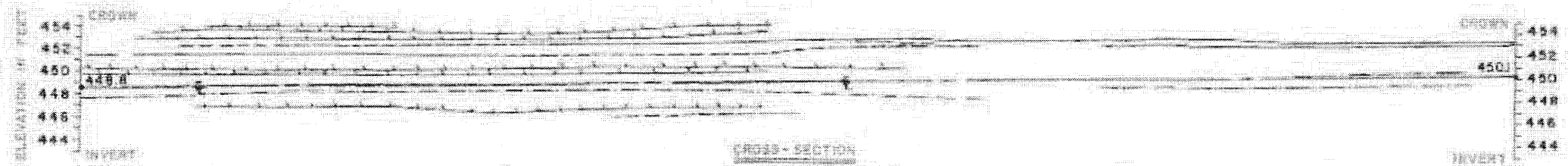
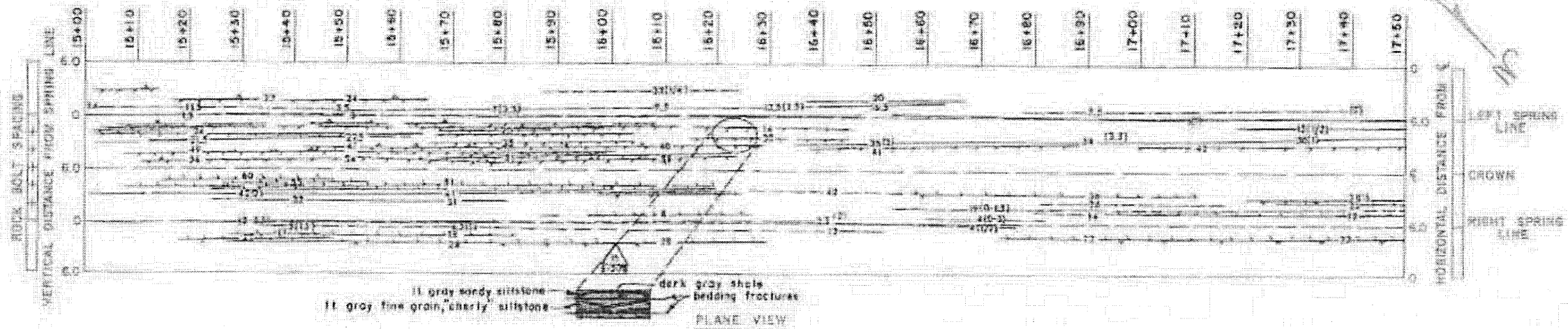
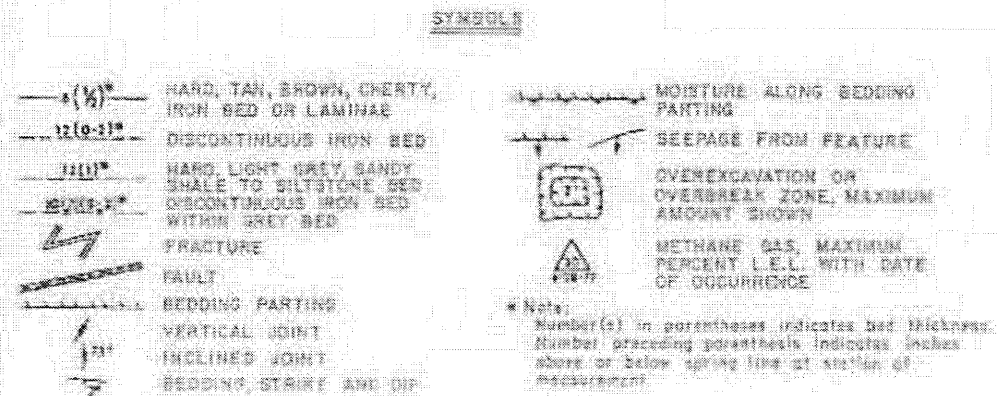
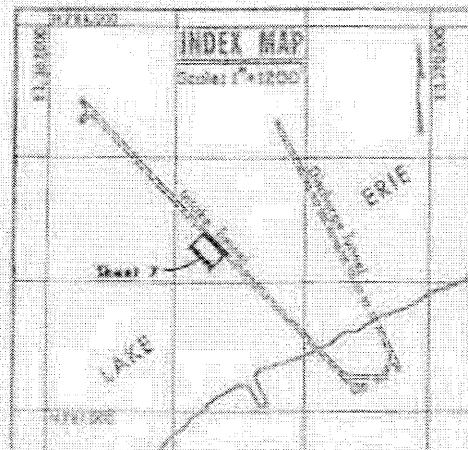
- EXCAVATION PROGRESS
- ESTIMATED ROCK CONDITION (TERZAGHI NO.)
- TEMPORARY SUPPORT SYSTEM
- BEDDING SPACING
- FRACTURE SPACING
- WATER CONDITION
- DEPTH OF COVER

(Rev. 12 1/03)

**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations

Figure 2.5-17 (Sheet 6 of 24)



Approx. 6'-10"	3'-9"	6'-10"
Slight scaling from crown along entire length of excavation (0-2' overbreak)		
1 rock bolts at 2' centers in steel ribs at 4.5 to 4.0' centers, spaced by wire mesh		
Bedding fractures only		
Approx. 20% of bedding fractures show minimal moisture		Approx. 10% of bedding fractures show moisture
14.5' water		16.5' water
107.2' water face (date)		103.9' water face (date)

EXCAVATION PROGRESS

ESTIMATED ROCK CONDITION (TERZAGHI NO.)

TEMPORARY SUPPORT SYSTEM

BEDDING SPACING

FRACTURE SPACING

WATER CONDITION

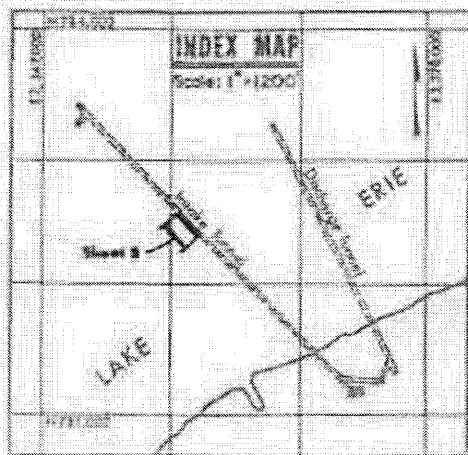
DEPTH OF COVER

(Rev. 12/1/03)

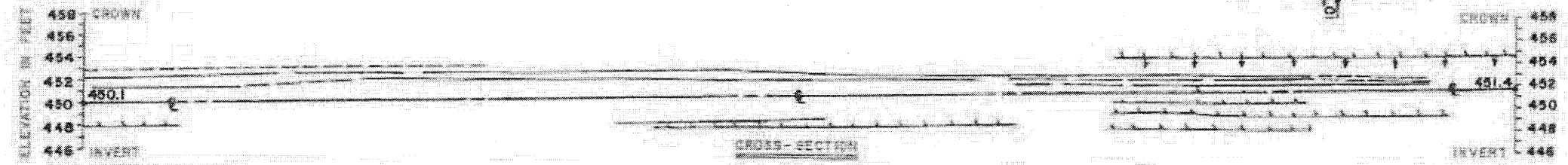
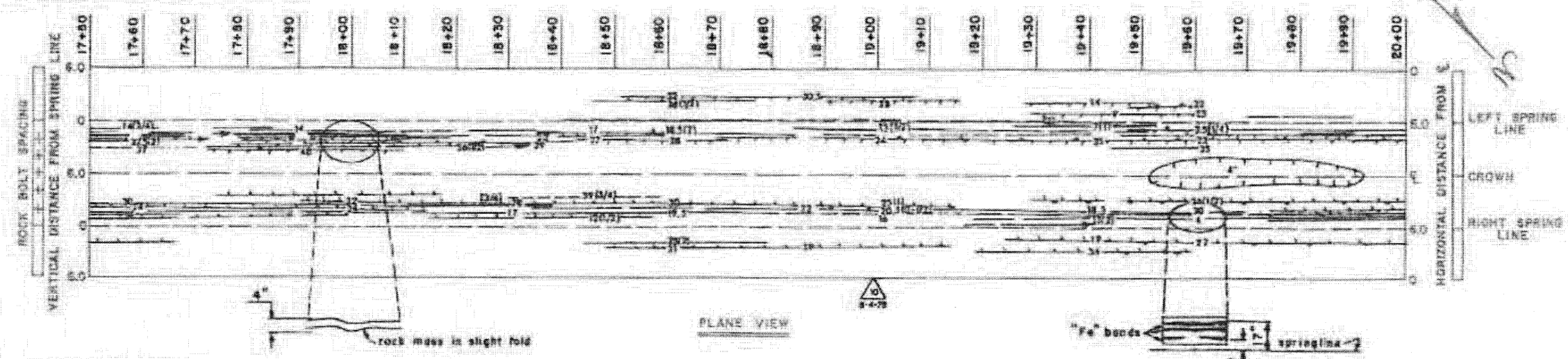
**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations

Figure 2.5-47 (Sheet 7 of 24)



- SYMBOLS**
- $\frac{1}{2} \text{ } \frac{1}{2}$  HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - $12(0.2)$  DISCONTINUOUS IRON BED
  - $13(1)$  HARD, LIGHT GREY, SANDY SHALE TO SILTYSTONE BED
  - $14(0.2)$  DISCONTINUOUS IRON BED WITHIN GREY BED
  - $\swarrow$  FRACTURE
  - $\text{---}$  FAULT
  - $\text{---}$  BEDDING PARTING
  - $\text{---}$  VERTICAL JOINT
  - $\text{---}$  INCLINED JOINT
  - $\text{---}$  BEDDING, STRIKE AND DIP
- $\text{---}$  MOISTURE ALONG BEDDING PARTING
  - $\text{---}$  SEEPAGE FROM FEATURE
  - $\square$  OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - $\triangle$  METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE
- \*Note:  
 Number(s) in parentheses indicates bed thickness.  
 Number preceding parenthesis indicates inches above or below spring line of station at measurement.



no. 4	Slight scaling along crown for entire length (between rock bolt 2 & 4)	Slight scaling from roof (0'-2')	no. 4
5 rock bolts at 3.0' centers in steel ribs at 3.5' to 4.0' centers, spanned by wire mesh		Same, ribs at 4.0' centers	
Approx. 4'		Approx. 4' to 10'	
Bedding fractures only			
Traces of moisture along a couple bedding fractures		Slight moisture on approx. 50% of the excavation	
14.5' water	101.6' subsurface (hole)	17.8' water	101.3' subsurface (hole)

- EXCAVATION PROGRESS
- ESTIMATED ROCK CONDITION (TERZAGHI NO.)
- TEMPORARY SUPPORT SYSTEM
- BEDDING SPACING
- FRACTURE SPACING
- WATER CONDITION
- DEPTH OF COVER

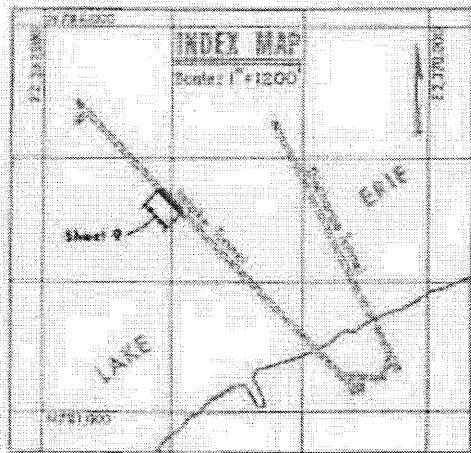
(REV. 12 1/03)

**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations

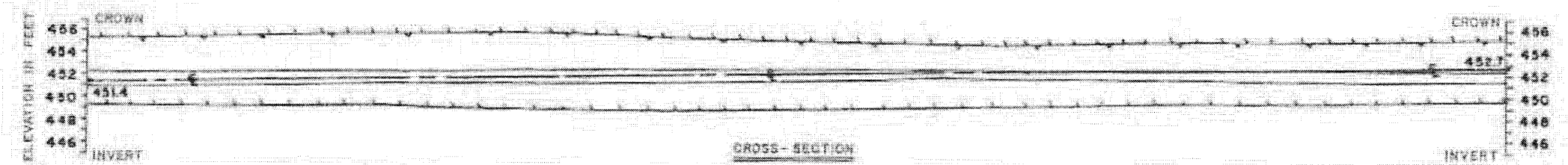
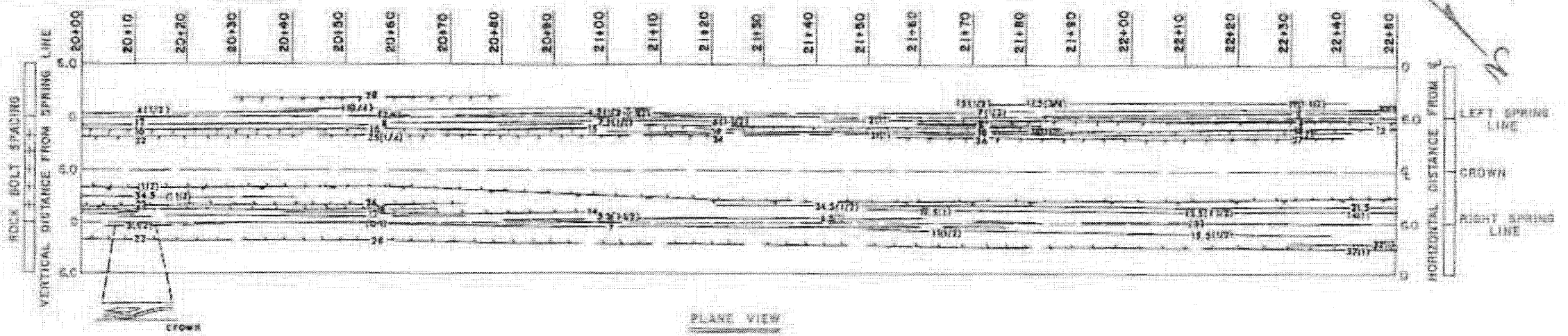
Figure 2.3-47 (Sheet 8 of 24)





- SYMBOLS**
- (X)\* HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - 12(0-2)\* DISCONTINUOUS IRON BED
  - 17(b)\* HARD LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - 10(2-3)\* DISCONTINUOUS IRON BED WITHIN GREY BED
  - ↔ FRACTURE
  - FAULT
  - BEDDING PARTING
  - VERTICAL JOINT
  - INCLINED JOINT
  - BEDDING, STRIKE AND DIP

- MOISTURE ALONG BEDDING PARTING
  - SEEPAGE FROM FEATURE
  - OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - △ METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE
- \*Note: Number(s) in parentheses indicates bed thickness. Number preceding parentheses indicates inches above or below spring line of station of measurement.



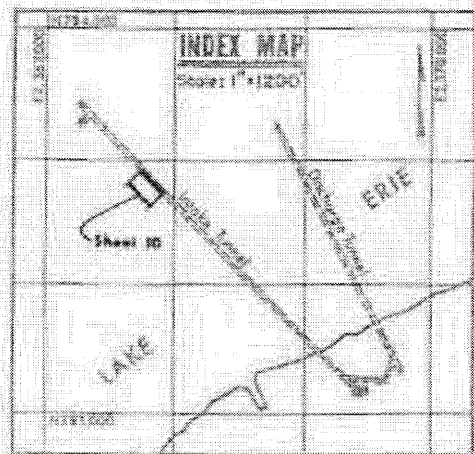
Excavation Progress	Estimated Rock Condition (ITERZAGH) NO.	Temporary Support System	Bedding Spacing	Fracture Spacing	Water Condition	Depth of Cover
2 rock bolts at 2' centers in steel ribs at 4' centers spanned by wire mesh	3	2 rock bolts at 2' centers in steel ribs at 3.5'-4.0' centers spanned by wire mesh	3'-2"	Bedding fractures only	17.3 water, 100.3 subsurface (hole)	17.3 water, 100.3 subsurface (hole)
Slight measure from open parting along east wall for entire length.						

(Rev. 12 1/03)

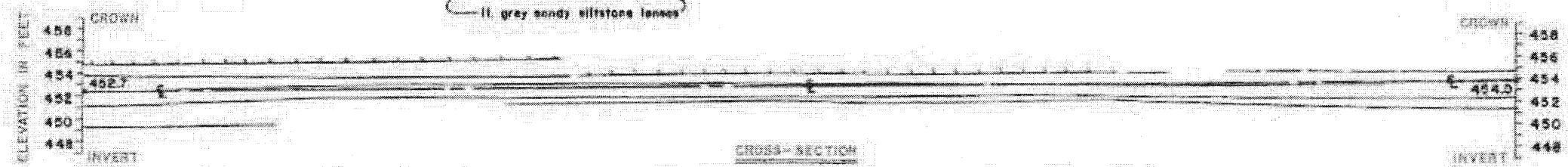
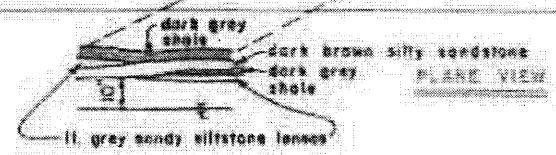
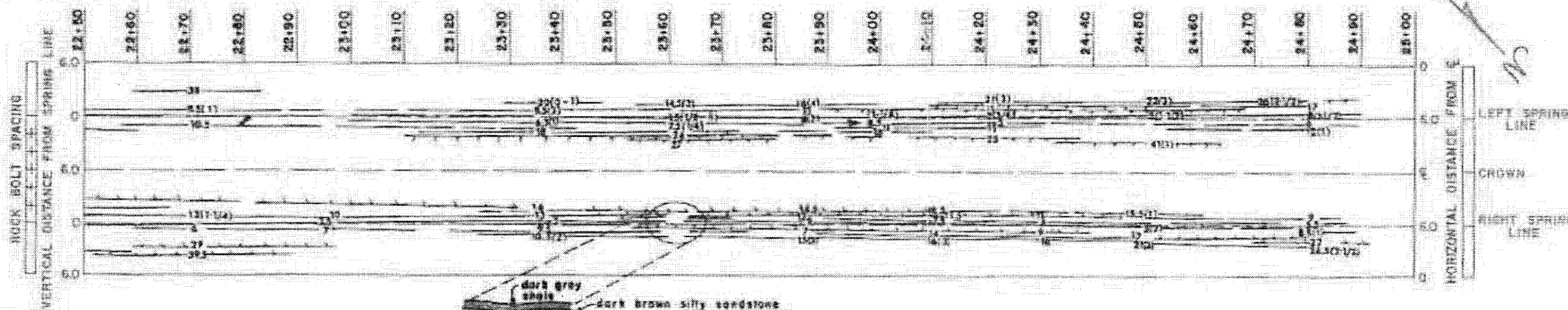
**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations

Figure 2.5-17 (Sheet 9 of 24)



- SYMBOLS**
- (11)°— HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - (10-2)°— DISCONTINUOUS IRON BED
  - (12)°— HARD, LIGHT GREY SANDY SHALE TO SILTSTONE BED
  - (10-2)°— DISCONTINUOUS IRON BED WITHIN GREY BED
  - ↗ FRACTURE
  - FAULT
  - BEDDING PARTING
  - VERTICAL JOINT
  - INCLINED JOINT
  - BEDDING, STRIKE AND DIP
- MOISTURE ALONG BEDDING PARTING
  - SEEPAGE FROM FEATURE
  - (2) OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - △ (10.7) METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE
- Note:*  
 Number(s) in parentheses indicates bed thickness.  
 Number preceding parenthesis indicates inches above or below spring line at station of measurement.



no. 4	no. 4
Slight overbreak between rock bolts nos. 2 & 4, 0'-6" deep (max) 2'-1"	Slight overbreak between rock bolts nos. 2 & 4, 1'-6" deep (max) 1'-1"
3 rock bolts at 2' centers in steel ribs at 33' to 40' centers, spaced by wire mesh	
3'-7"	2'-9"
Bedding fractures only, spaced as above	
Moist bedding fracture, above springline along east wall	
No seepage	

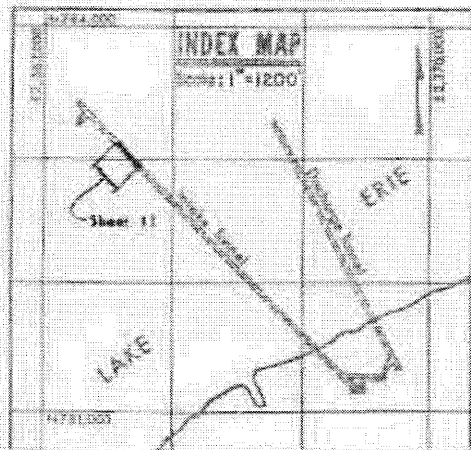
EXCAVATION PROGRESS  
 ESTIMATED ROCK CONDITION (TERZAGHI NO.)  
 TEMPORARY SUPPORT SYSTEM  
 BEDDING SPACING  
 FRACTURE SPACING  
 WATER CONDITION  
 DEPTH OF COVER

(Rev. 12 1/03)

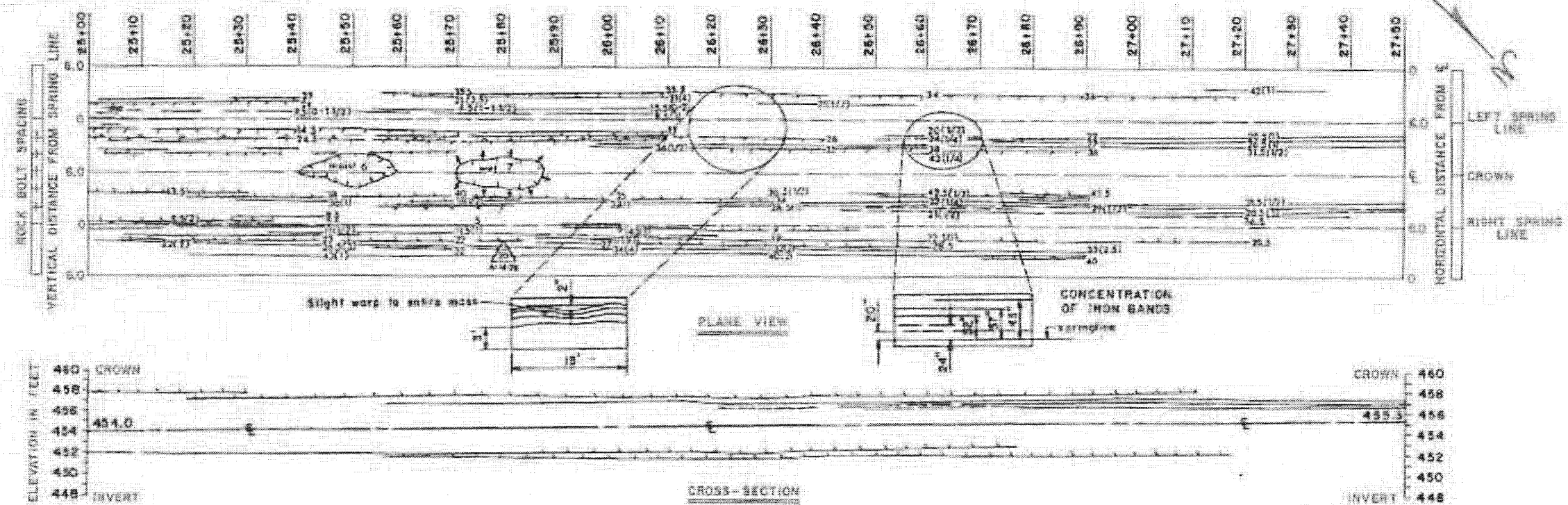
**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations

Figure 2.5-47 (Sheet 10 of 24)



- SYMBOLS**
- HARD, TAN, BROWN, CERTY, IRON BED OR LAMINAR
  - DISCONTINUOUS IRON BED
  - HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - DISCONTINUOUS IRON BED WITHIN GREY BED
  - FRACTURE
  - FAULT
  - BEDDING PARTING
  - VERTICAL JOINT
  - INCLINED JOINT
  - BEDDING, STRIKE AND DIP
  - MOISTURE ALONG BEDDING PARTING
  - SEEPAGE FROM FEATURE
  - OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE
- Note:**  
 Number(s) in parenthesis indicates bed thickness.  
 Number preceding parenthesis indicates inches above or below spring line at station of measurement.



3'-9"	3'-7"	Additional rock bolts and ribs added to prohibit additional overbreak	4'-10"	4'-8"
Bedding features only, spotted as above				
Slight seep from overbreak in crown		Slight moisture along bedding features		No seepage
18.5' lake water		23.7' water		
24.0' water face (shown)		24.7' subsurface (total)		

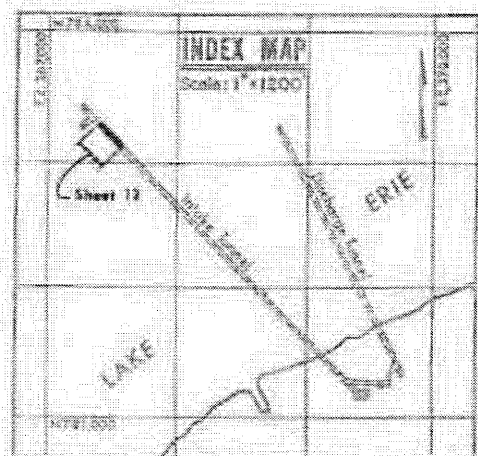
EXCAVATION PROGRESS  
 ESTIMATED ROCK CONDITION (TERZAGHI NO. 1)  
 TEMPORARY SUPPORT SYSTEM  
 BEDDING SPACING  
 FRACTURE SPACING  
 WATER CONDITION  
 DEPTH OF COVER

(REV. 12 1/83)

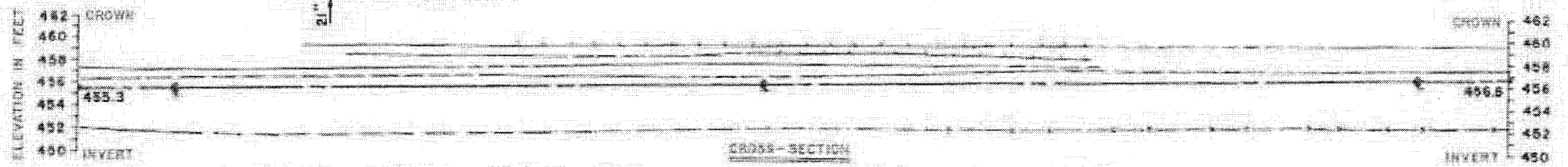
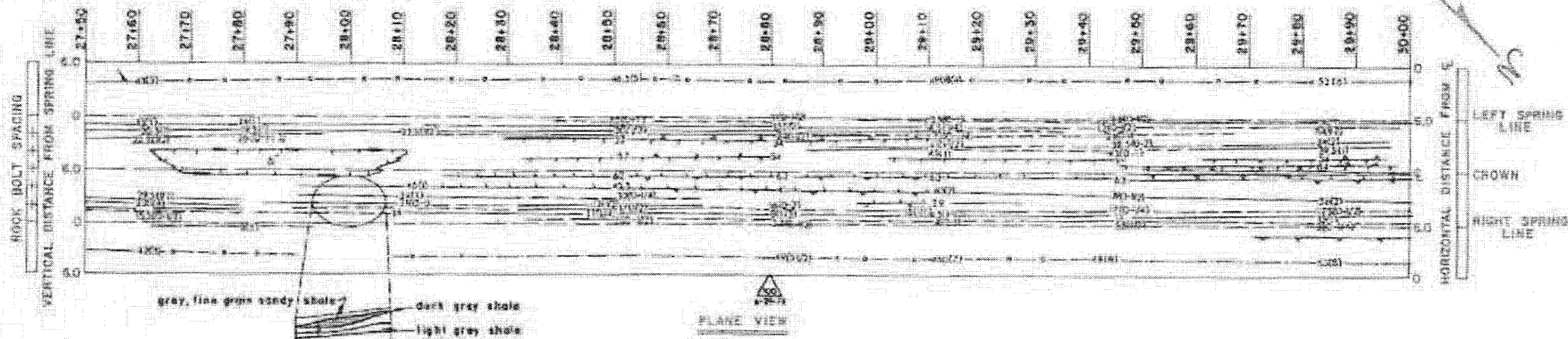
**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations

Figure 2.5-47 (Sheet 11 of 24)



- SYMBOLS**
- HARD, TAN, BROWN, CERTY, IRON BED OR LAMINAE
  - DISCONTINUOUS IRON BED
  - HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - DISCONTINUOUS IRON BED WITHIN GREY BED
  - FRACTURE
  - FAULT
  - BEDDING PARTING
  - VERTICAL JOINT
  - INCLINED JOINT
  - BEDDING, STRIKE AND DIP
- MOISTURE ALONG BEDDING PARTING**
- SEEPAGE FROM FEATURE**
- OVEREXCAVATION OR OVERBREAK IONS, MAXIMUM AMOUNT SHOWN**
- METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE**
- Note:**  
Number(s) in parentheses indicates bed thickness.  
Number preceding parenthesis indicates inches above or below spring line of station of measurement.



Overbreak 5" deep limited by vertical joints, trending parallel to tunnel bearing	5" overbreak along strike section in crown
1 rock bolts at 4' centers in steel ribs at 4' centers spanned by wire mesh	5 rock bolts at 2' centers in steel ribs at 4' centers spanned by wire mesh
Bedding fractures only, spaced as above	
Slight seepage from all bedding fractures	
20% water at surface (shale)	Slight moisture from bedding fractures in crown 22.5% water at surface (shale)

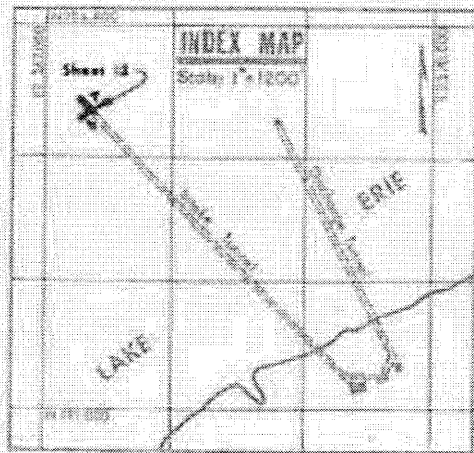
- EXCAVATION PROGRESS
- ESTIMATED ROCK CONDITION (TERZAGHI NO.)
- TEMPORARY SUPPORT SYSTEM
- BEDDING SPACING
- FRACTURE SPACING
- WATER CONDITION
- DEPTH OF COVER

(Rev. 12/1/03)

**PERRY NUCLEAR POWER PLANT**

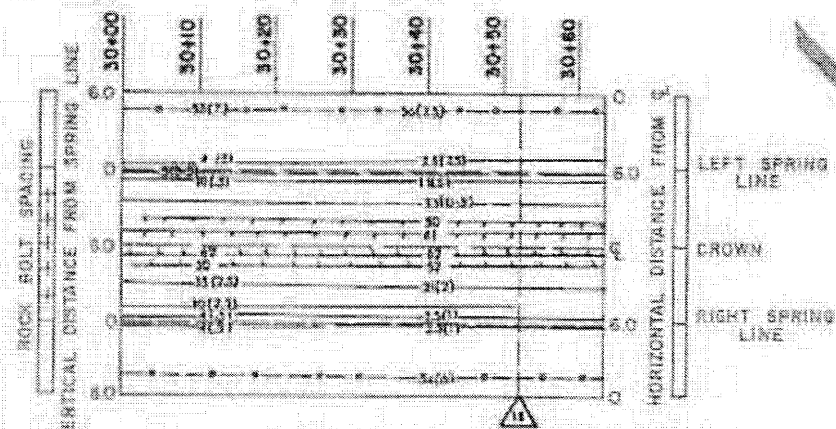
Geologic Map of Tunnel Excavations

Figure 2.5-47 (Sheet 12 of 24)

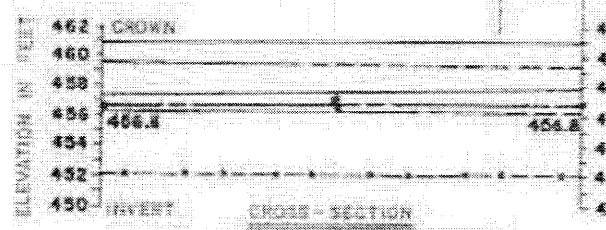


- 4(1/2)"\* HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
- 12(8-2)"\* DISCONTINUOUS IRON BED
- 17(1)"\* HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
- 10(22-1)"\* DISCONTINUOUS IRON BED WITHIN GREY BED
- FRACTURE
- FAULT
- BEDDING PARTING
- VERTICAL JOINT
- INCLINED JOINT
- BEDDING, STRIKE AND DIP

- MOISTURE ALONG BEDDING PARTING
  - SEEPAGE FROM FEATURE
  - OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE
- \*Note:  
 Number(s) in parentheses indicates bed thickness.  
 Number preceding parenthesis indicates inches above or below spring line at station of measurement.

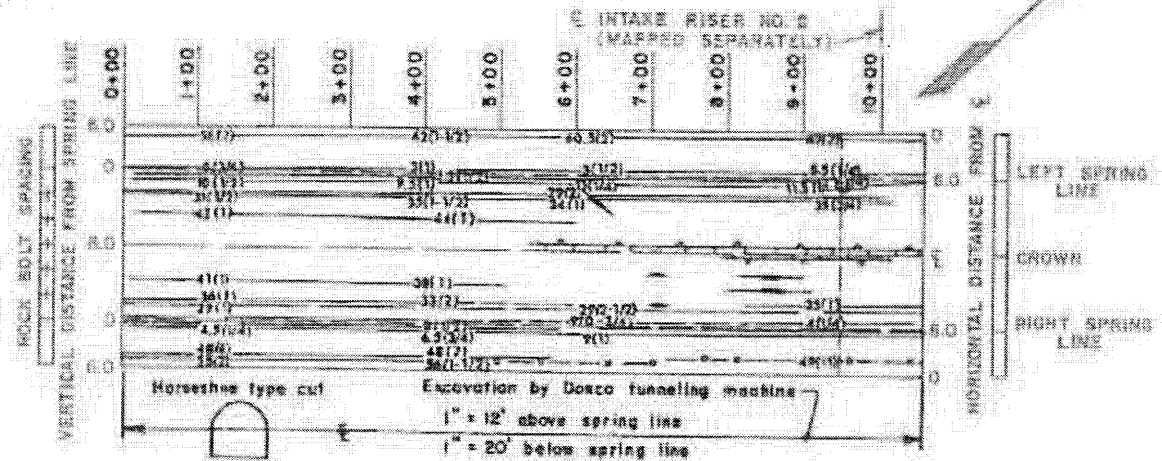


PLANE VIEW A  
 INT. RISER NO. 1 (MAPPED SEPARATELY)

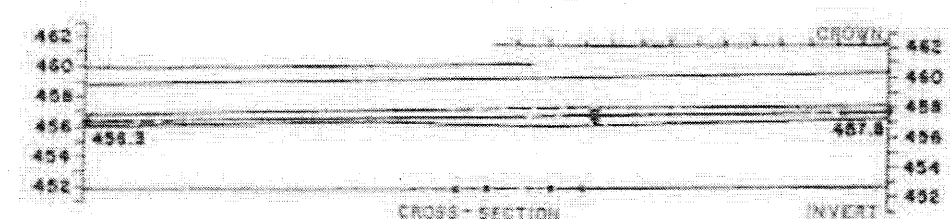


Excavation Progress	ESTIMATED ROCK CONDITION (TERZAGHI NO.)
TEMPORARY SUPPORT SYSTEM	BEDDING SPACING
FRACTURE SPACING	WATER CONDITION
DEPTH OF COVER	

Excavation Progress  
 ESTIMATED ROCK CONDITION (TERZAGHI NO.)  
 TEMPORARY SUPPORT SYSTEM  
 BEDDING SPACING  
 FRACTURE SPACING  
 WATER CONDITION  
 DEPTH OF COVER



PLANE VIEW B



Excavation Progress	ESTIMATED ROCK CONDITION (TERZAGHI NO.)
TEMPORARY SUPPORT SYSTEM	BEDDING SPACING
FRACTURE SPACING	WATER CONDITION
DEPTH OF COVER	

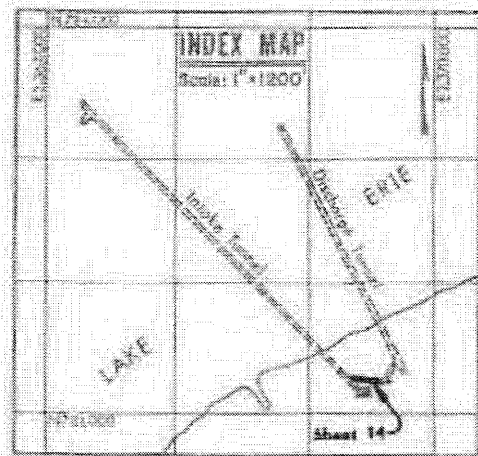
Excavation Progress  
 ESTIMATED ROCK CONDITION (TERZAGHI NO.)  
 TEMPORARY SUPPORT SYSTEM  
 BEDDING SPACING  
 FRACTURE SPACING  
 WATER CONDITION  
 DEPTH OF COVER

(REV. 12 1/83)

**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations

Figure 2.5-47 (Sheet 13 of 24)

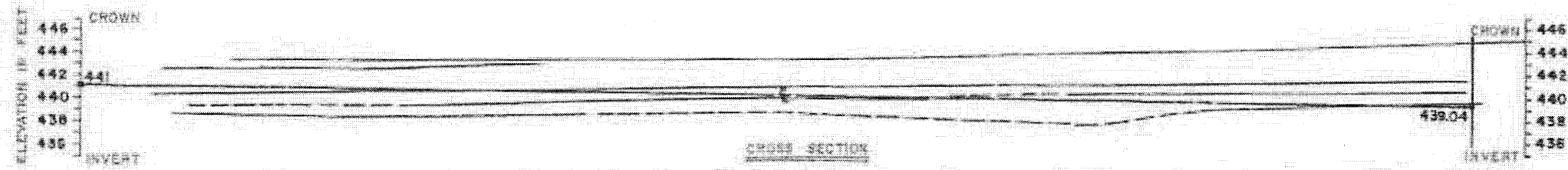
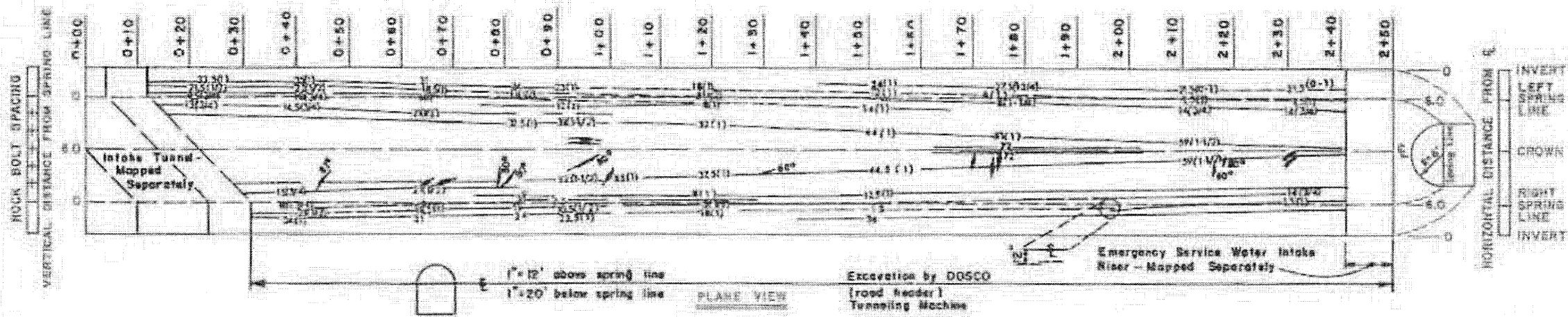


- 4 1/2" HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
- 2 (0-2)" DISCONTINUOUS IRON BED
- 12 (0)" HARD, LIGHT GREY, SANDY SHALE TO SILTYSTONE BED
- 18 (0-2)" DISCONTINUOUS IRON BED WITHIN GREY BED
- ↔ FRACTURE
- FAULT
- BEDDING PARTING
- VERTICAL JOINT
- INCLINED JOINT
- BEDDING, STRIKE AND DIP

**SYMBOLS**

- MOISTURE ALONG BEDDING PARTING
- SEEPAGE FROM FEATURE
- ☐ OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
- ⚠ METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE

**Note:**  
 Numerical in parenthesis indicates bed thickness. Number preceding parenthesis indicates inches above or below spring line at station of measurement.



NO. 4										
3 rock bolts or 2 cables in steel ribs at 2' spacing supported by wire mesh										
2'-6"	2'	1'2"-4"	2'-6"	2'-2"	2'-4"	1'-6"	2'-6"	2'-2"	2'-6"	
1'	Widely spaced 10'-20'	1'-10'					Widely spaced 20'			
No support										
approx. 32.5' of excavations exp. 32.5' general fill 18.5' of shale					approx. 31.5' of excavations exp. 32.5' general fill 18.5' of shale					

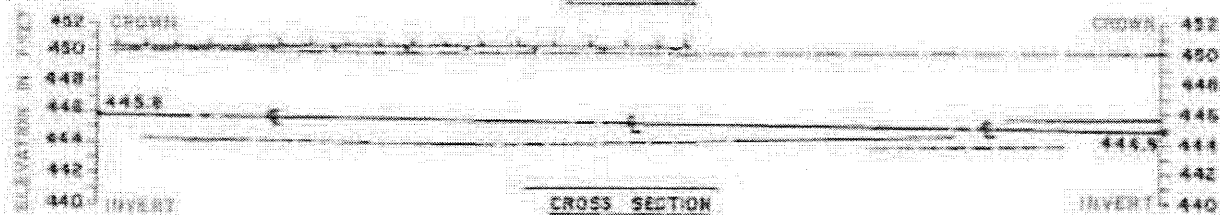
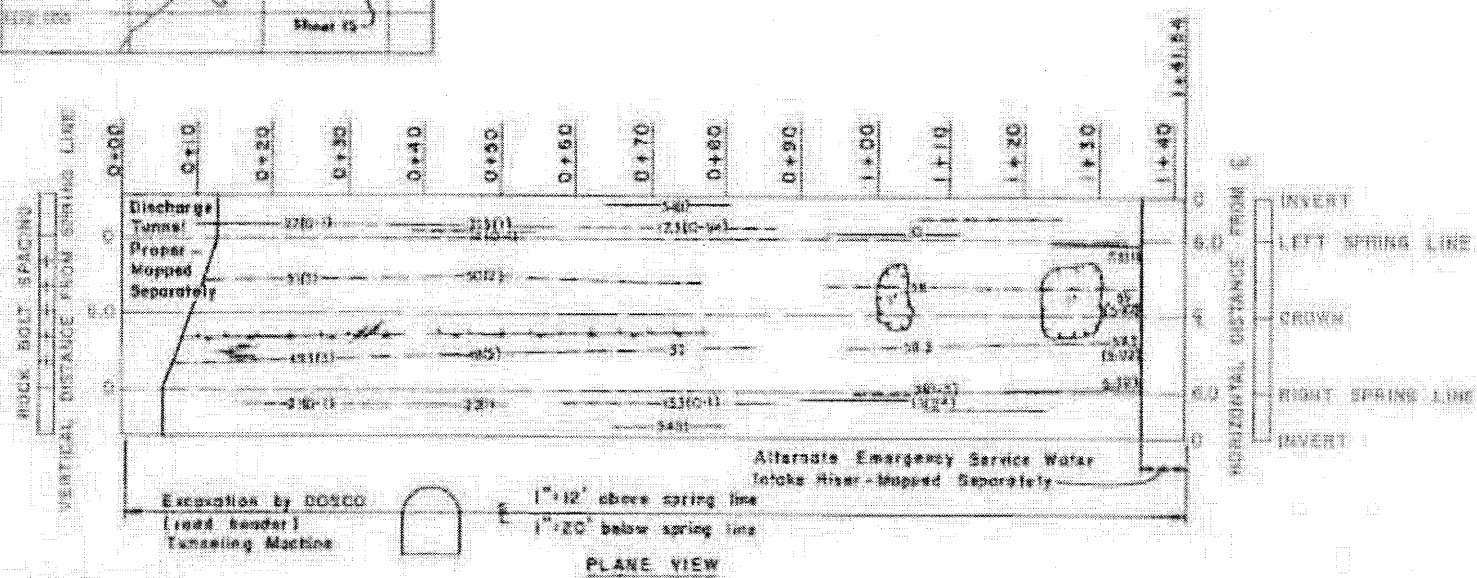
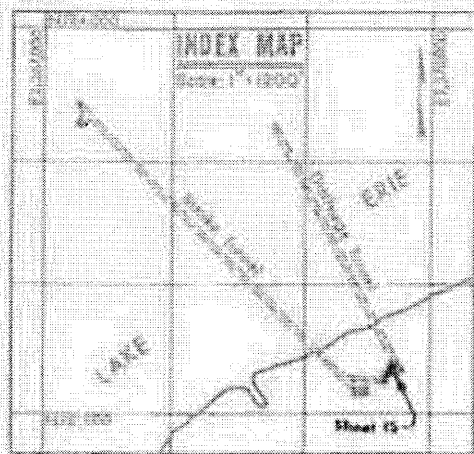
- EXCAVATION PROGRESS
- ESTIMATED ROCK CONDITION (TERZAGHI NO.)
- TEMPORARY SUPPORT SYSTEM
- BEDDING SPACING
- FRACTURE SPACING
- WATER CONDITION
- DEPTH OF COVER

(Rev. 12 1/03)

**PERRY NUCLEAR POWER PLANT**

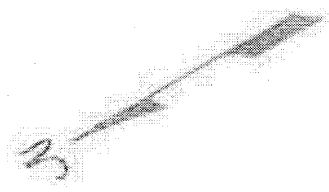
Geologic Map of Tunnel Excavations

Figure 2.5-47 (Sheet 14 of 24)



3 rock bolts at 7' centers in steel ribs at 3.0'-11' centers, spaced by wire mesh			
17'-2"	6'-2"	7'-2"	Approx. 1.5' spacing lagging
Bedding fractures only, spaced or above			
Slight seepage from bedding parting along west wall		No inflow	
Approx. 25' thickness 12' gravel fill 110' shale		Approx. 25' thickness 12' gravel fill 110' shale	

EXCAVATION PROGRESS  
ESTIMATED ROCK CONDITION (TERZAGH NO.)  
TEMPORARY SUPPORT SYSTEM  
BEDDING SPACING  
FRACTURE SPACING  
WATER CONDITION  
DEPTH OF COVER



- SYMBOLS**
- HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - DISCONTINUOUS IRON BED
  - HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - DISCONTINUOUS IRON BED WITHIN GREY BED
  - FRACTURE
  - FAULT
  - BEDDING PARTING
  - VERTICAL JOINT
  - INCLINED JOINT
  - BEDDING, STRIKE AND DIP
  - MOISTURE ALONG BEDDING PARTING
  - SEEPAGE FROM FEATURE
  - OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM ANCHOR THROWN

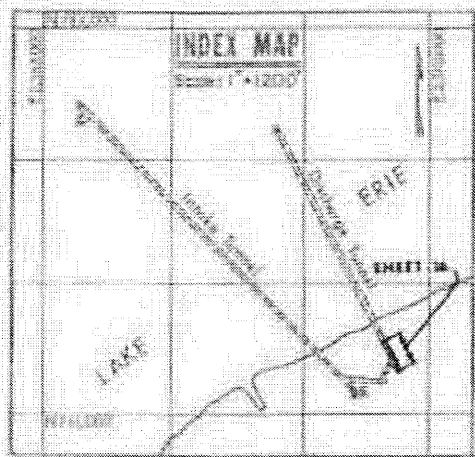
\*Note:  
Numbers in parentheses indicates bed thickness.  
Number preceding parenthesis indicates inches above or below spring line or station of measurement.

(Rev. 12 1/03)

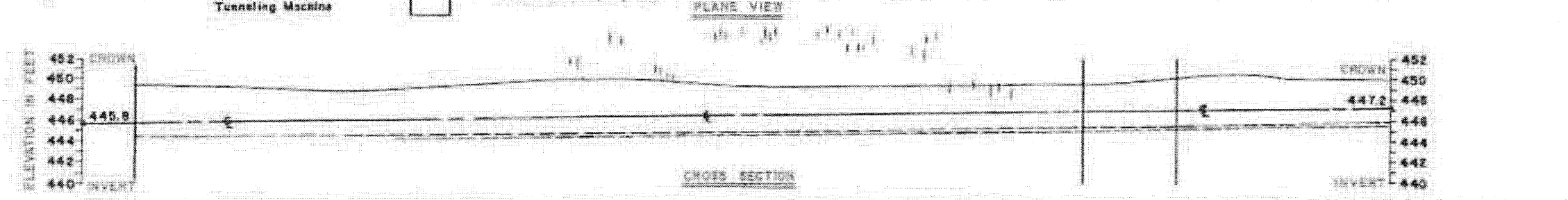
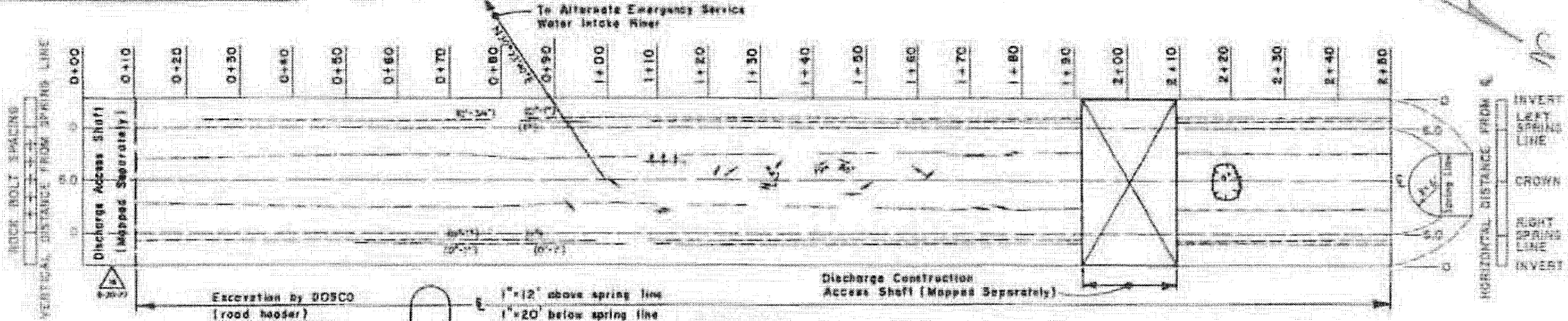
**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel  
Excavations

Figure 3.5-47 (Sheet 15 of 24)



- SYMBOLS**
- (X)° HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - || (0-2)° DISCONTINUOUS IRON BED
  - || (1)° HARD LIGHT GREY SANDY SHALE TO SLTSTONE BED
  - || (0-2)° DISCONTINUOUS IRON BED WITHIN GREY BED
  - ↔ FRACTURE
  - FAULT
  - BEDDING PARTING
  - VERTICAL JOINT
  - INCLINED JOINT
  - BEDDING, STRIKE AND DIP
  - MOISTURE ALONG BEDDING PARTING
  - SEEPAGE FROM FEATURE
  - OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM SEDIMENT SHOWN
  - △ METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE
- \* Note: Number(s) in parenthesis indicates bed thickness. Number preceding parenthesis indicates inches above or below spring line at station of measurement.



2'-5"	1/2'-6"	1/2'-6"	2'-6"	1'-2"	1'-7"	1/2'-8"
No seepage		Seepage out of parting @ above springline on west wall		No seepage		Noticed substantial amount of moisture in downshot. May be from melting ice
Approx. 11.1' limestone			Approx. 11.1' limestone + 2.2' Special U.I. & 10.8' shale			

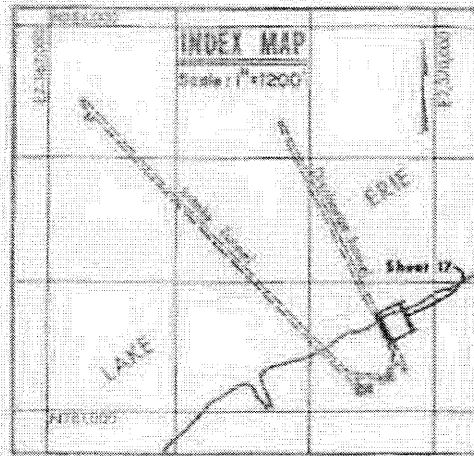
EXCAVATION PROGRESS  
 ESTIMATED ROCK CONDITION (TERZAGHI NO.)  
 TEMPORARY SUPPORT SYSTEM  
 BEDDING SPACING  
 FRACTURE SPACING  
 WATER CONDITION  
 DEPTH OF COVER

(Rev. 12 1/03)

**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations  
 Figure 2.5-47 (Sheet 16 of 24)



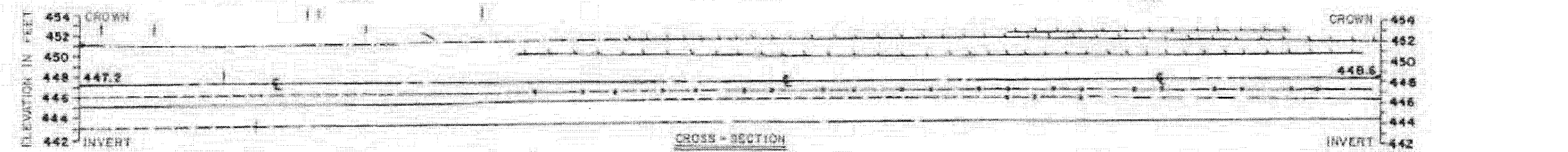
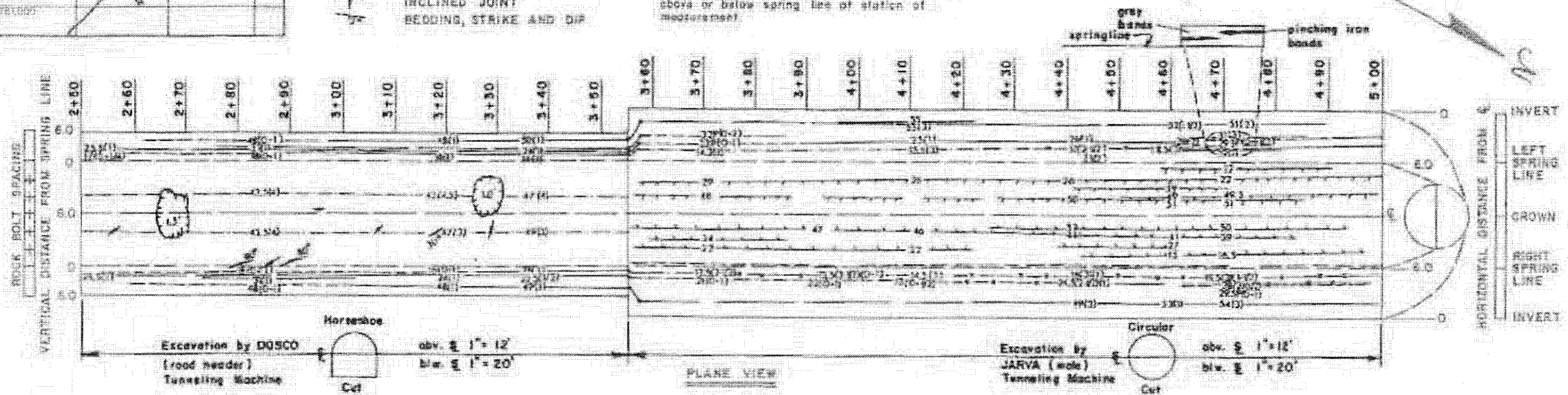


- HARD, TAN, BROWN, CHERTY IRON BED OR LAMINAE
- DISCONTINUOUS IRON BED
- HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
- DISCONTINUOUS IRON BED WITHIN GREY BED
- FRACTURE
- FAULT
- BEDDING PARTING
- VERTICAL JOINT
- INCLINED JOINT
- BEDDING, STRIKE AND DIP

**SYMBOLS**

- MOISTURE ALONG BEDDING PARTING
- SEEPAGE FROM FEATURE
- OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN

\* Note:  
 Number(s) in parenthesis indicate bed thickness.  
 Number preceding parenthesis indicates inches above or below spring line of station of measurement.



1'-2"		1'-3"		1'-4"		1'-5"		1'-6"		1'-7"		1'-8"		1'-9"		1'-10"	
5 rock bolts at 2' centers in steel ribs at 20'-23' centers, spanned by wire mesh																	
Jointing less apparent in smooth circular hole excavation																	
Bedding fracture only, traced at above																	
No inflow																	
Approx. 24' distance & 34' diameter (11) 11.8' shaft																	
Approx. 7' at base of 1/2' of shaft																	

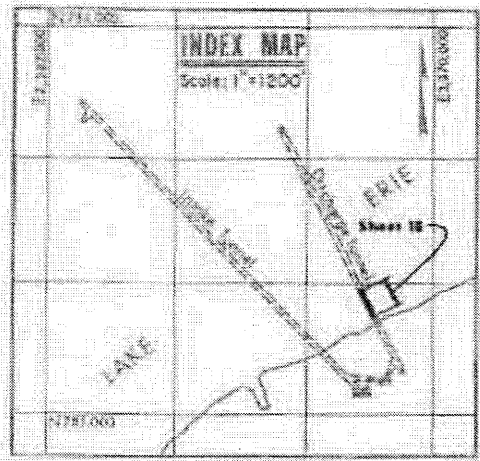
- EXCAVATION PROGRESS
- ESTIMATED ROCK CONDITION (TERZAGHI NO.)
- TEMPORARY SUPPORT SYSTEM
- BEDDING SPACING
- FRACTURE SPACING
- WATER CONDITION
- DEPTH OF COVER

(Rev. 12 1/03)

**PERRY NUCLEAR POWER PLANT**

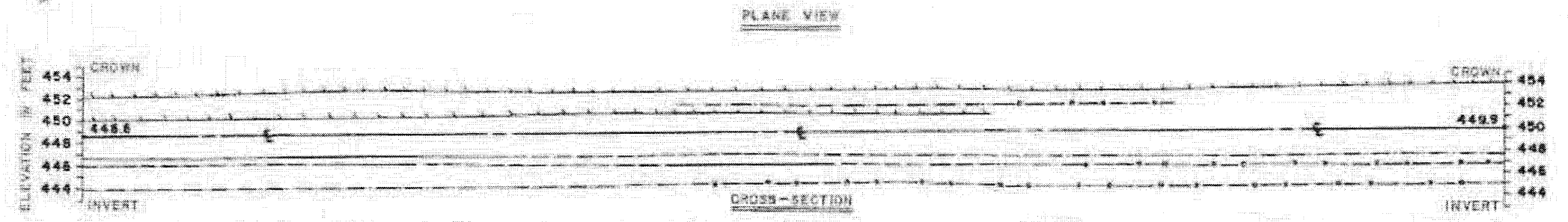
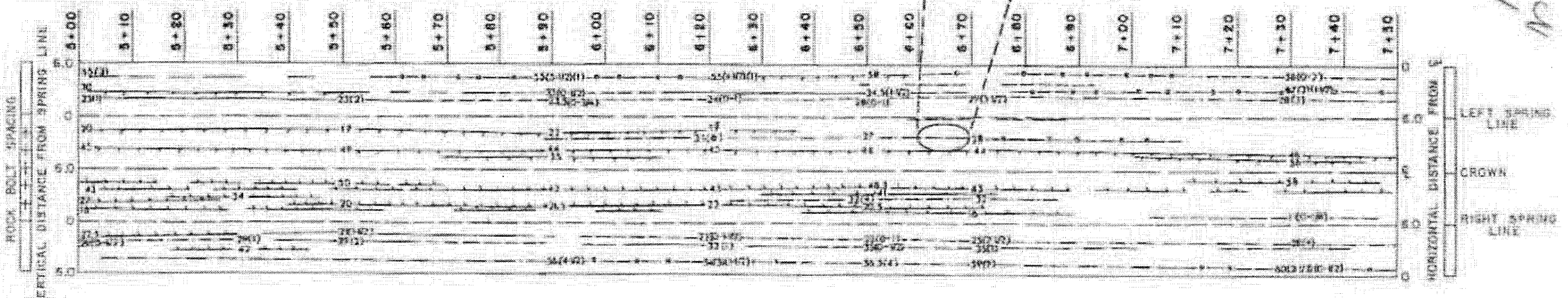
Geologic Map of Tunnel Excavations

Figure 2.5-47 (Sheet 17 of 24)



- SYMBOLS**
- 4(X)° HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - 2(2-2)° DISCONTINUOUS IRON BED
  - 2(1)° HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - 10(20-2)° DISCONTINUOUS IRON BED WITHIN GREY BED
  - ⚡ FRACTURE
  - FAULT
  - BEDDING PARTING
  - ↑ VERTICAL JOINT
  - ↘ INCLINED JOINT
  - BEDDING, STRIKE AND DIP

- MOISTURE ALONG BEDDING PARTING
  - SEEPAGE FROM FEATURE
  - ⊖ OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - ⚠ METHANE GAS, MAXIMUM PERCENT L.C.L. WITH DATE OF OCCURRENCE
- \*Note: Numerical in parentheses indicates bed thickness. Number preceding parenthesis indicates inches above or below spring line of station of measurement.



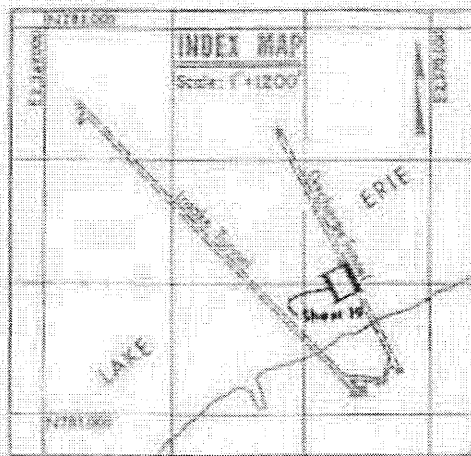
Excavation Progress	Estimated Rock Condition (Terzaghi No.)	Temporary Support System	Bedding Spacing	Fracture Spacing	Water Condition	Depth of Cover
5+00 to 5+40	5	3" x 3" bolts @ 2' centers in steel ribs at 25'-40' centers, spanned by wire mesh	3'-11"	Bedding fractures only, spaced as above	No inflow	4' water, 11.1' subsurface (hole)
5+40 to 7+30	5	Steel ribs at 20'-40' centers	7'-12"	Bedding fractures only, spaced as above	No inflow	4' water, 11.1' subsurface (hole)

(Rev. 12/1/63)

**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations

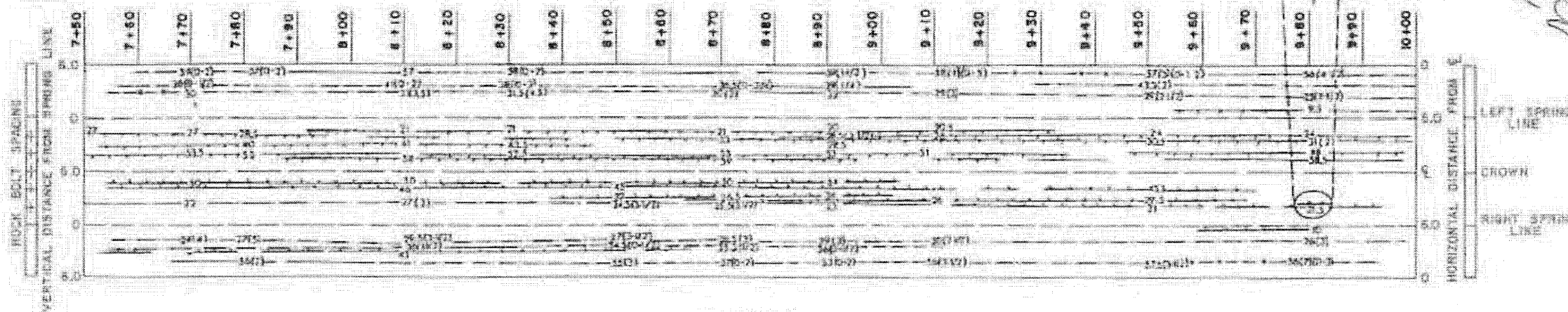
Figure 2.5-47 (Sheet 18 of 24)



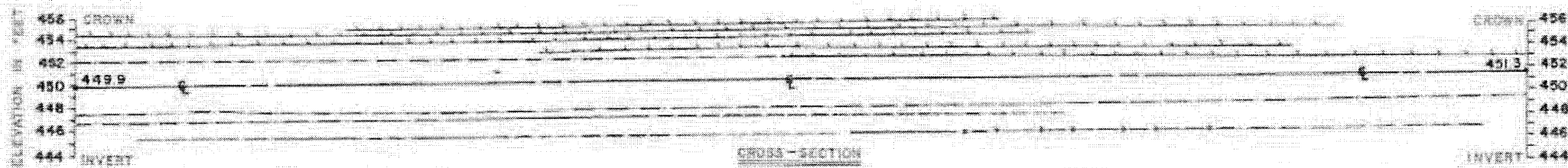
- HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
- DISCONTINUOUS IRON BED
- HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
- DISCONTINUOUS IRON BED WITHIN GREY BED
- FRACTURE
- FAULT
- BEDDING PARTING
- VERTICAL JOINT
- INCLINED JOINT
- BEDDING, STRIKE AND DIP

**SYMBOLS**

- MOISTURE ALONG BEDDING PARTING
  - SEEPAGE FROM FEATURE
  - OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE
- Notes:**  
 Numbers in parentheses indicates bed thickness.  
 Number preceding parenthesis indicates inches above or below spring line at station of measurement.



PLANE VIEW



CROSS-SECTION

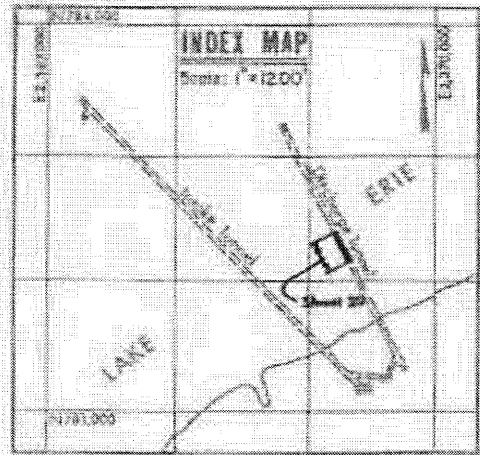
no. 4
rock bolts at 2' centers in steel ribs at 2'-4' centers, spanned by wire mesh
8'-12"
Bedding fractures only, spaced as above
No inflow
2.5' top water 116.1' subsurface (dune)

- EXCAVATION PROGRESS
- ESTIMATED ROCK CONDITION (TERZAGHI NO.)
- TEMPORARY SUPPORT SYSTEM
- BEDDING SPACING
- FRACTURE SPACING
- WATER CONDITION
- DEPTH OF COVER

(Rev. 12/1/83)

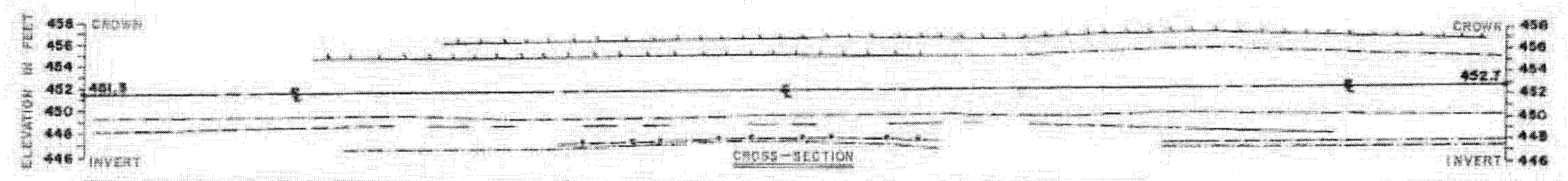
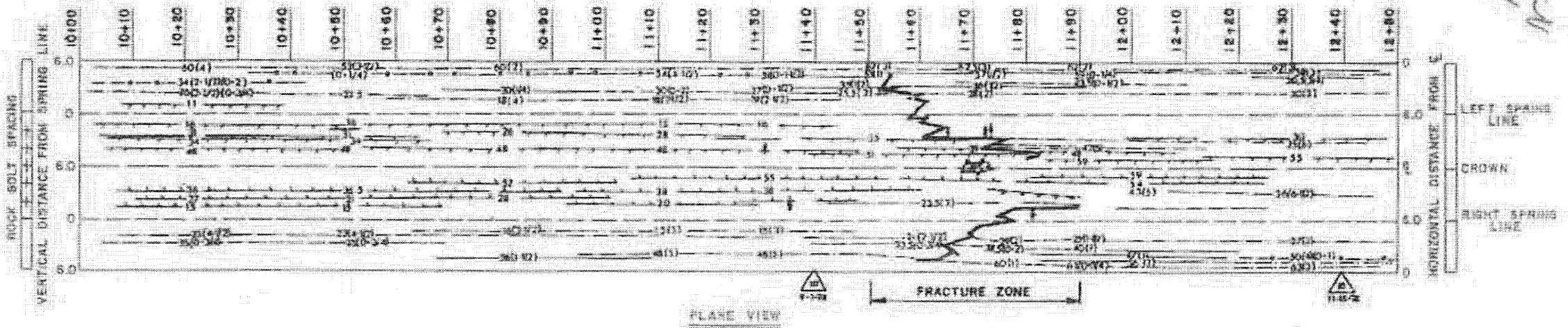
**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations  
 Figure 2.5-47 (Sheet 19 of 24)



- SYMBOLS**
- $4\frac{1}{2}^{\circ}$  HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
  - $12\frac{1}{2}-21^{\circ}$  DISCONTINUOUS IRON BED
  - $12\frac{1}{2}^{\circ}$  HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - $10\frac{1}{2}-20^{\circ}$  DISCONTINUOUS IRON BED WITHIN GREY BED
  - $\swarrow$  FRACTURE
  - $\text{---}$  FAULT
  - $\text{---}$  BEDDING PARTING
  - $\text{---}$  VERTICAL JOINT
  - $\text{---}$  INCLINED JOINT
  - $\text{---}$  BEDDING, STRIKE AND DIP

- $\text{---}$  MOISTURE ALONG BEDDING PARTING
  - $\text{---}$  SEEPAGE FROM FEATURE
  - $\text{---}$  OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - $\text{---}$  METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE
- Note:  
 Number(s) in parentheses indicates bed thickness.  
 Number preceding parenthesis indicates inches above or below spring line at station of measurement.



No. 4		No. 4	
3 rock bolts at 2' centers in steel ribs at 4.0'-4.3' centers, spanned by wire mesh.			
3'-10"		3'-9"	
Bedding fractures only, spaced as above		Zone of fractures in chevron pattern cutting excavation at low angle	
No inflows		Seepage from rock bolts	Seepage from bedding partings in fractured zone
No inflows		No inflows	
7.5' water		8.5' water	
+ 111.7' subsurface (shale)		+ 109.7' subsurface (shale)	

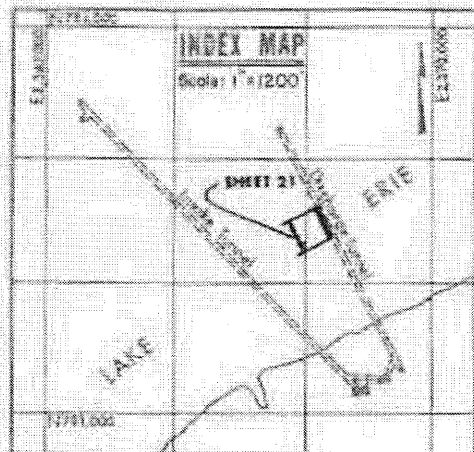
- EXCAVATION PROGRESS
- ESTIMATED ROCK CONDITION (TERZAGHI NO.)
- TEMPORARY SUPPORT SYSTEM
- BEDDING SPACING
- FRACTURE SPACING
- WATER CONDITION
- DEPTH OF COVER

(Rev. 12 1/03)

**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations

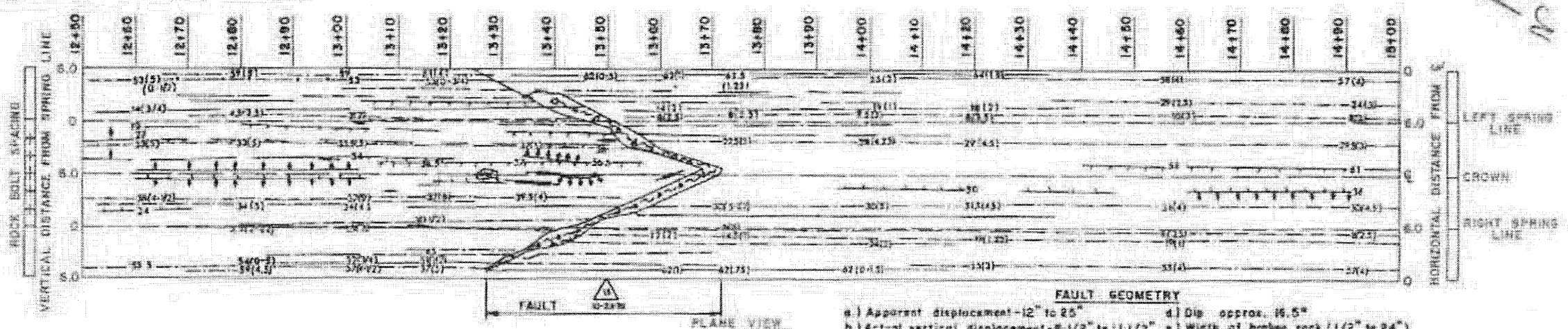
Figure 2.5-47 (Sheet 20 of 24)



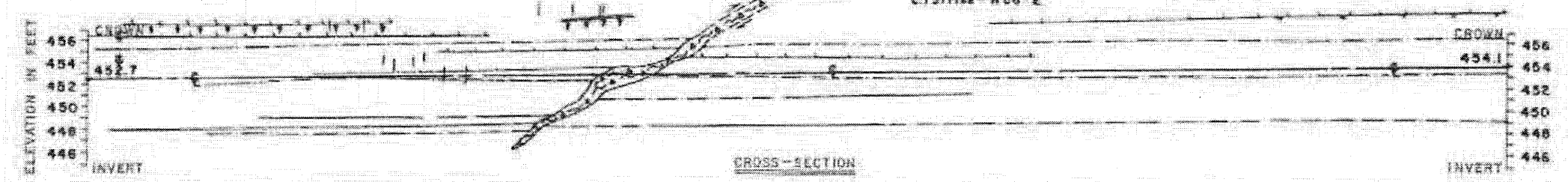
- HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINAE
- DISCONTINUOUS IRON BED
- HARD, LIGHT GREY SANDY SHALE TO SILTSTONE BED
- DISCONTINUOUS IRON BED WITHIN GREY BED
- FRACTURE
- FAULT (with sense of motion)
- BEDDING PARTING
- VERTICAL JOINT
- INCLINED JOINT
- BEDDING, STRIKE AND DIP

**SYMBOLS**

- MOISTURE ALONG BEDDING PARTING
  - SEEPAGE FROM FEATURE
  - OVEREXCAVATION ON OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE
- \* Note: Number(s) in parentheses indicates bed thickness. Number preceding parenthesis indicates inches above or below spring line at station of measurement.



**FAULT GEOMETRY**  
 a) Apparent displacement - 12" to 25"      d) Dip approx. 16.5°  
 b) Actual vertical displacement - 8 1/2" to 11 1/2"      e) Width of broken rock (1/2" to 24")  
 c) Strike - N 66° E



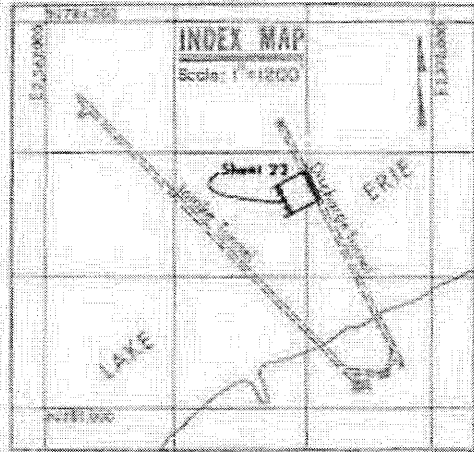
STATION	12450	12500	12600	12700	12800	12900	13000	13100	13200	13300	13400	13500	13600	13700	13800	13900	14000	14100	
Excavation Progress	No. 4										No. 4-8					No. 4			
Estimated Rock Condition (Terzaghi No.)	3										4					3			
Temporary Support System	3" x 9" ribs at 2' centers										Full shielding employed					5 rock bolts at 7' centers in steel ribs at 3.5' x centers spanned by wire mesh			
Bedding Spacing	Bedding fractures spaced as above, joints widely spaced										Joint pairs shown at 2'-1.5' apart otherwise bedding fractures at 3'-9"					Bedding fractures only, spaced as above			
Fracture Spacing	Most bedding fractures where indicated										Several minor joints in fractured areas					Several bedding lines along shielding, two max. widths of 6.1' and 6.5' each			
Water Condition	8.5' water										10.2' subsurface (shale)					12.5' water			
Depth of Cover	10.2' subsurface (shale)															12.5' water			

(Rev. 12 1/03)

**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations

Figure 2.5-47 (Sheet 21 of 24)

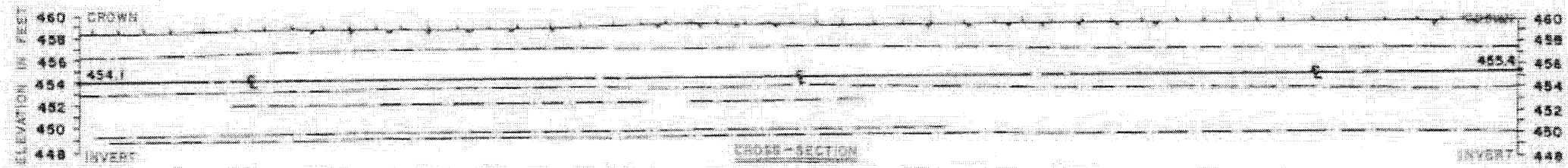
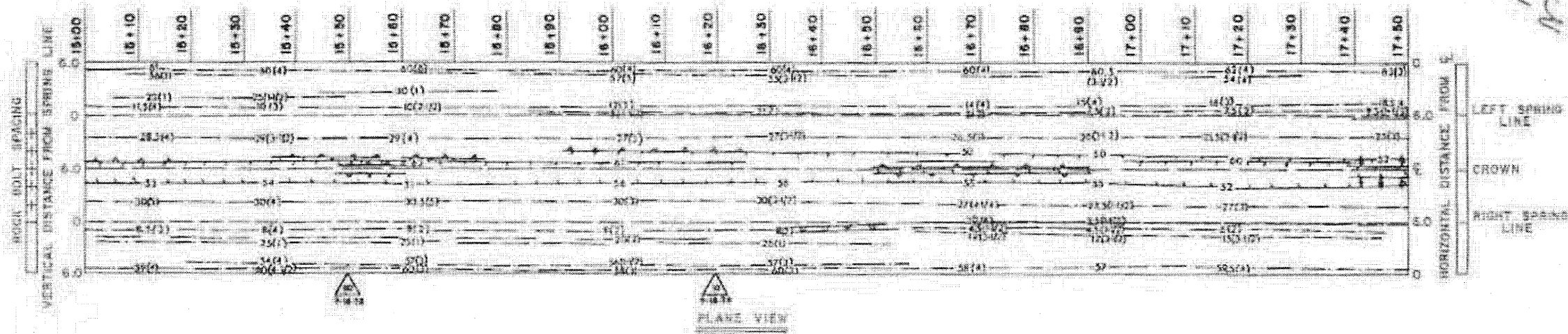


- 4 1/2" HARD, TAN, BROWN, CHERTY IRON BED OR LAMINAE
- 12 (0-2)" DISCONTINUOUS IRON BED
- 12 (0-2)" HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
- 12 (0-2)" DISCONTINUOUS IRON BED WITHIN GREY BED
- FRACTURE
- FAULT (with sense of motion)
- BEDDING PARTING
- VERTICAL JOINT
- INCLINED JOINT
- BEDDING, STRIKE AND DIP

**SYMBOLS**

- MOISTURE ALONG BEDDING PARTING
- SEEPAGE FROM FEATURE
- OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
- METHANE GAS, MAXIMUM PERCENT L.E.L. WITH DATE OF OCCURRENCE


\* Note: Numbers in parentheses indicates bed thickness. Number preceding parentheses indicates inches above or below spring line at station of measurement.

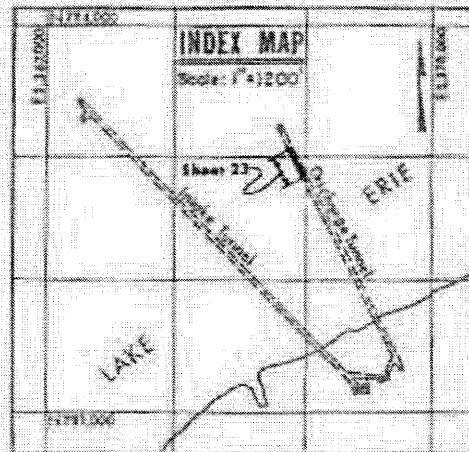


Slight overbreak along entire excavation (0'-6")				no 4	
5 rock bolts at 2' centers in steel ribs at 40'-45' centers spanned by wire mesh					
3'-9"		4'-9"		3'-10"	
Bedding fractures only, spaced as above					
Moisture from bedding parting			Minimal seepage from bedding parting		
+ 1.5' water			+ 13.5' water		
+ 30' V' subsurface (hole)			+ 30' V' subsurface (hole)		

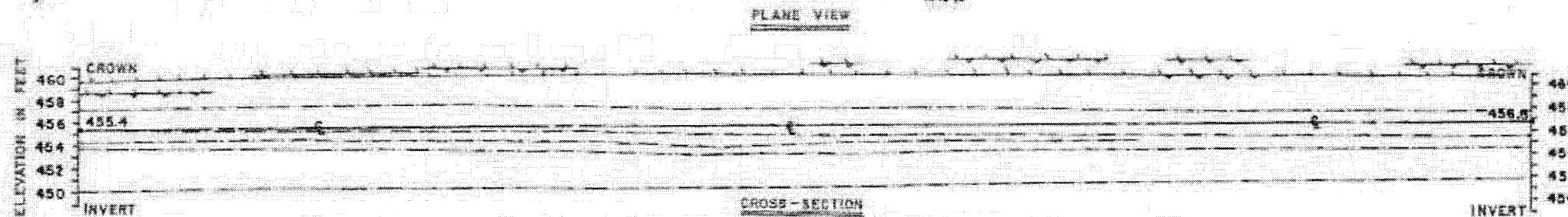
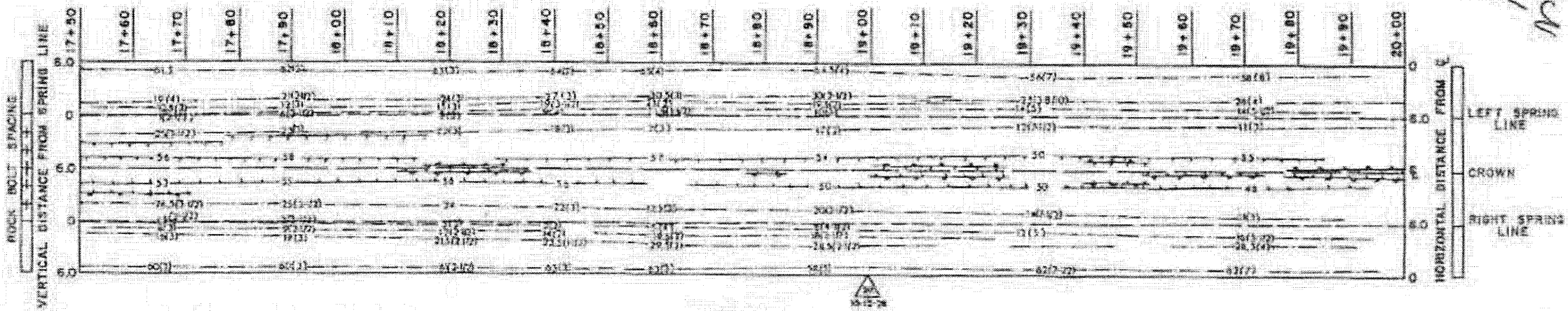
EXCAVATION PROGRESS  
 ESTIMATED ROCK CONDITION (TERZAGHI NO.)  
 TEMPORARY SUPPORT SYSTEM  
 BEDDING SPACING  
 FRACTURE SPACING  
 WATER CONDITION  
 DEPTH OF COVER

(Rev. 12 1/83)


**PERRY NUCLEAR POWER PLANT**  
 Geologic Map of Tunnel Excavations  
 Figure 2.5-17 (Sheet 22 of 24)



- SYMBOLS**
- HARD, TAN, BROWN, CHERTY, IRON BED OR LAMINÆ
  - DISCONTINUOUS IRON BED
  - HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - DISCONTINUOUS IRON BED WITHIN GREY BED
  - FRACTURE
  - FAULT
  - BEDDING PARTING
  - VERTICAL JOINT
  - INCLINED JOINT
  - BEDDING, STRIKE AND DIP
  - MOISTURE ALONG BEDDING PARTING
  - SEEPAGE FROM FEATURE
  - OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN
  - METHANE GAS, MAXIMUM PERCENT L.I.L. WITH DATE OF OCCURRENCE
- Note:**  
 Number(s) in parentheses indicates bed thickness.  
 Number preceding parenthesis indicates inches above or below spring line at station of measurement.



3'-10"		4'-12"	
No. 4			
5 rock bolts at 2' centers in steel ribs at 4.0'-4.5' centers, spanned by wire mesh			
Moisture from bedding partings		Moisture from bedding partings	
Moisture from bedding partings		Moisture from bedding partings	

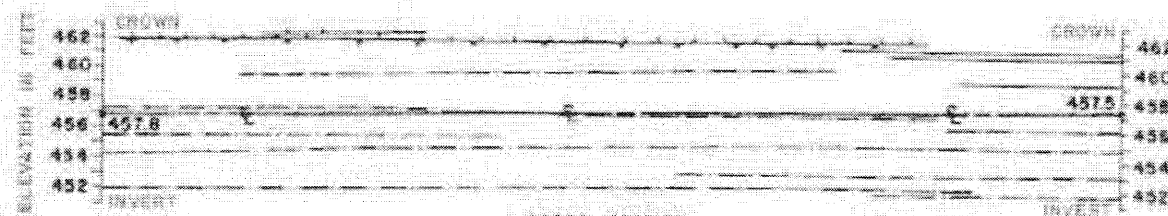
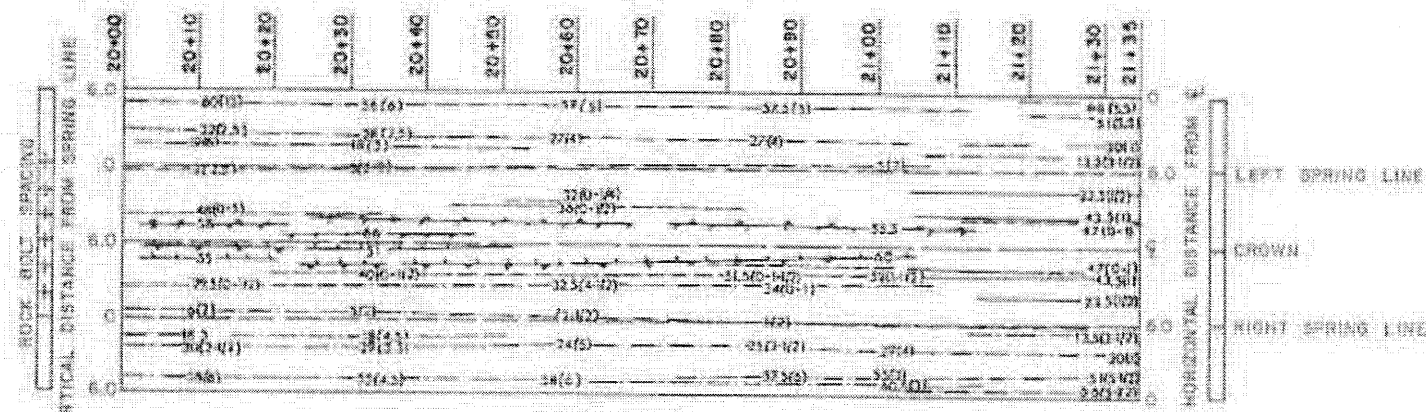
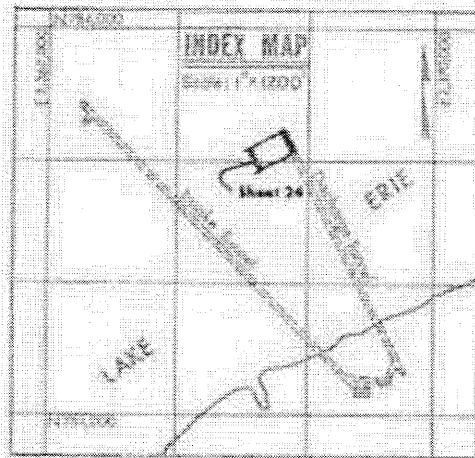
- EXCAVATION PROGRESS
- ESTIMATED ROCK CONDITION (TERZAGHI NO.)
- TEMPORARY SUPPORT SYSTEM
- BEDDING SPACING
- FRACTURE SPACING
- WATER CONDITION
- DEPTH OF COVER

(Rev. 12 1/03)

**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations

Figure 2.5-47 (Sheet 23 of 24)



Excavation Address	Estimated Rock Condition (Terzaghi No.)
20+00	2
20+10	2
20+20	2
20+30	2
20+40	2
20+50	2
20+60	2
20+70	2
20+80	2
20+90	2
21+00	2
21+10	2
21+20	2
21+30	2
21+35	2

Excavation Address  
 Estimated Rock Condition (Terzaghi No.)  
 Temporary Support System  
 Bedding Spacing  
 Fracture Spacing  
 Water Condition  
 Depth of Cover

- SYMBOLS**
- HARD, TAN, BROWN, CERTY, IRON BED OR LAMINAE
  - DISCONTINUOUS IRON BED
  - HARD, LIGHT GREY, SANDY SHALE TO SILTSTONE BED
  - DISCONTINUOUS IRON BED WITHIN GREY BED
  - FRACTURE
  - FAULT
  - BEDDING PARTING
  - VERTICAL JOINT
  - INCLINED JOINT
  - BEDDING, STRIKE AND DIP
  - MOISTURE ALONG BEDDING PARTING
  - SEEPAGE FROM FEATURE
  - OVEREXCAVATION OR OVERBREAK ZONE, MAXIMUM AMOUNT SHOWN

**Note:**  
 Number(s) in parenthesis indicates bed thickness.  
 Number preceding parenthesis indicates inches above or below spring line of station of measurement.

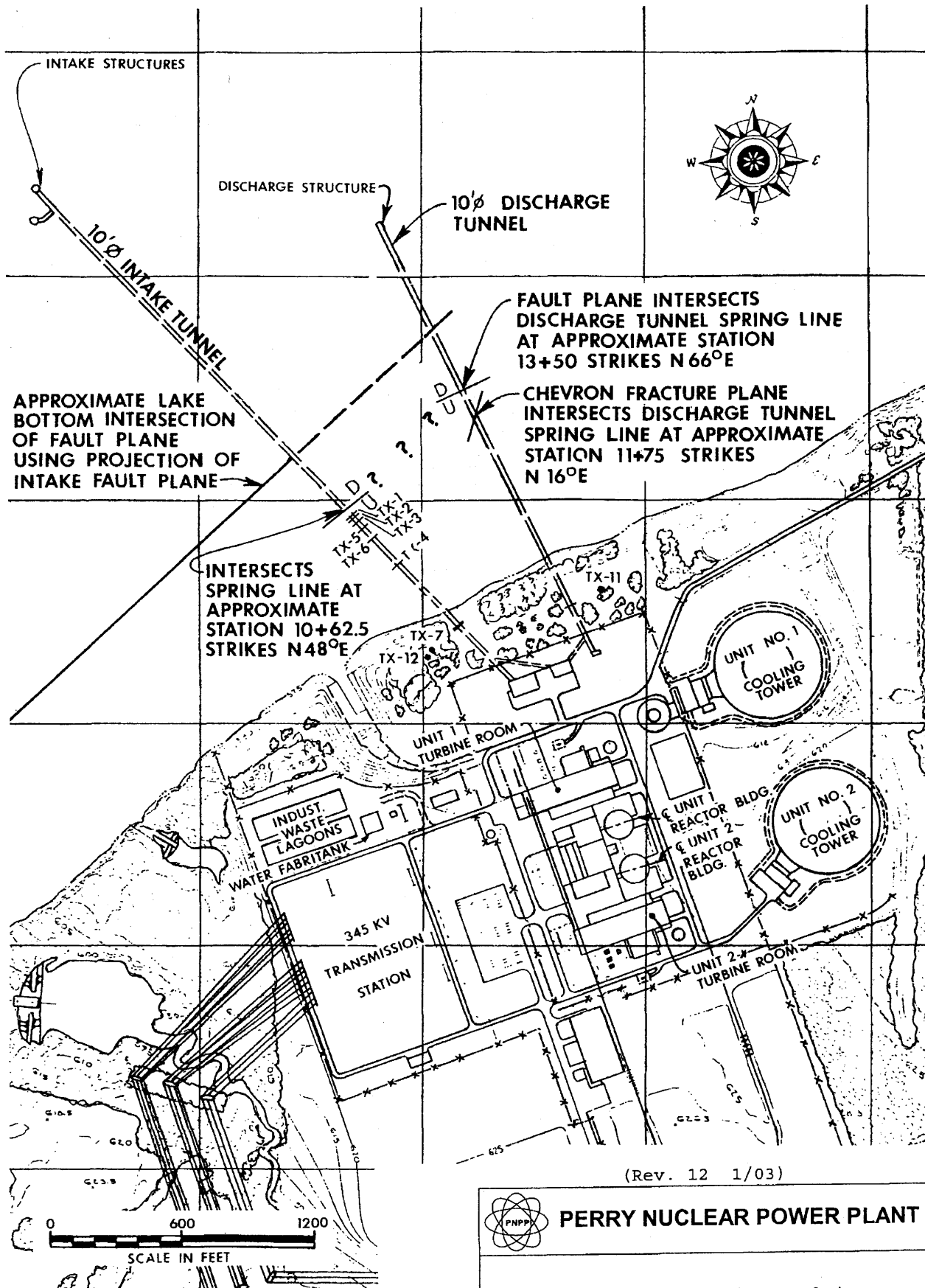
(Rev. 12/1/03)


**PERRY NUCLEAR POWER PLANT**

Geologic Map of Tunnel Excavations

Figure 2.5-47 (Sheet 24 of 24)

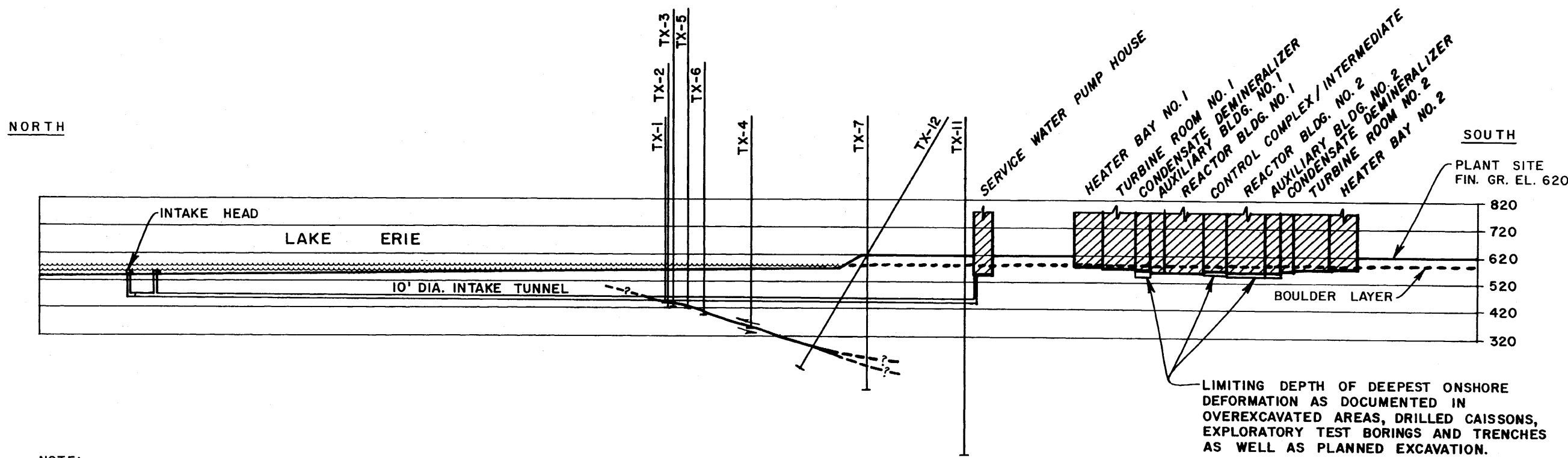




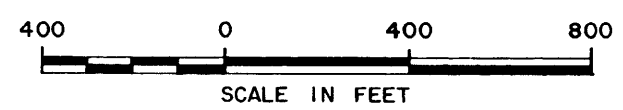
 **PERRY NUCLEAR POWER PLANT**

Tunnel Intersecting Faulting


Figure 2.5-48



NOTE:  
 PLANNED EXCAVATION LIMITS ARE SHOWN BY DIAGONAL PATTERN, AND OVEREXCAVATION BY STIPPLED PATTERN.



(Rev. 12 1/03)

 **PERRY NUCLEAR POWER PLANT**

Schematic Northwest - Southeast Cross Section

Figure 2.5-49